

MichaelG Lee/DC/USEPA/US
12/13/2010 12:51 PM

To: Matthew Klasen
cc: Kevin Minoli
bcc:
Subject: my comments on the revised draft letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Matt,
Here are my quick edits/comments on Friday's version of the Leeco letter. Let me know if you have any questions about this.



xxx14.docx

ATTACHMENT REDACTED - DELIBERATIVE

Matthew Klasen

[Here's the most recent draft. mk](#)

12/10/2010 04:58:14 PM

From: Matthew Klasen/DC/USEPA/US
To: MichaelG Lee/DC/USEPA/US@EPA
Date: 12/10/2010 04:58 PM
Subject: Fw: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Here's the most recent draft.

mk

Matt Klasen

U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/10/2010 04:58 PM -----

From: Brian Frazer/DC/USEPA/US
To: Stan Meiburg/R4/USEPA/US@EPA
Cc: Duncan Powell/R4/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, KevinH Miller/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Tom Welborn/R4/USEPA/US@EPA
Date: 12/10/2010 01:58 PM
Subject: Re: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Stan - (b) (5) There were three minor edits that is needed for clarity, Here is the last version is entitled 12-10 from me. Thanks

[attachment "2010-12-10 Leeco Draft Closeout Letter khm edits clean.docx" deleted by MichaelG Lee/DC/USEPA/US]

Brian M. Frazer, Chief
Wetlands & Aquatic Resources Regulatory Branch
Office of Wetlands, Oceans and Watersheds
U.S. EPA

1200 Pennsylvania Avenue, NW (MC 4502T)
Washington, DC 20460
202-566-1652

Stan Meiburg

Brian, I read your version you sent this morning...

12/10/2010 01:06:38 PM

From: Stan Meiburg/R4/USEPA/US
To: KevinH Miller/R4/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA
Cc: Duncan Powell/R4/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Tom Welborn/R4/USEPA/US@EPA
Date: 12/10/2010 01:06 PM
Subject: Re: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Brian, I read your version you sent this morning against this one. (b) (5)

Stan

A. Stanley Meiburg
Deputy Regional Administrator
EPA Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303

Office: (404) 562-8357
Fax: (404) 562-9961
Cell: (404) 435-4234
Email: meiburg.stan@epa.gov



Healthier Families, Cleaner Communities, A Stronger America
<http://www.epa.gov/40th>

KevinH Miller

Gentlemen, I have revised the version of the lett...

12/10/2010 11:00:40 AM

From: KevinH Miller/R4/USEPA/US
To: Stan Meiburg/R4/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Tom Welborn/R4/USEPA/US@EPA
Cc: Duncan Powell/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA
Date: 12/10/2010 11:00 AM
Subject: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Gentlemen,

I have revised the version of the letter Matt sent yesterday, as we have discussed. Track changes and clean versions attached.

Please feel free to call me if you have any questions. I will be driving back to Atlanta this afternoon, and working on the special conditions over the weekend.

Thanks, Kevin

Matt, after we spoke, all the things I came across seemed pretty clear, so I went ahead and made changes without the discussion we had planned for noon. But call me if you have any questions, or if you think I have misrepresented anything.

[attachment "2010-12-09 Leeco Draft Closeout Letter khm edits.docx" deleted by Brian Frazer/DC/USEPA/US]

[attachment "2010-12-09 Leeco Draft Closeout Letter khm edits clean.docx" deleted by Brian Frazer/DC/USEPA/US]

Kevin H. Miller
Physical Scientist/Landscape Ecologist
Mining Section/Wetlands, Coastal and Oceans Branch
Water Protection Division/EPA Region 4
Sam Nunn Atlanta Federal Center
Mail Code 9T25/61 Forsyth Street, SW
Atlanta, GA 30303-8960

404.562.9435/404.562.9343 (fax)
miller.kevinh@epa.gov
www.epa.gov/region4/water/wetlands

Karen Gude/DC/USEPA/US
12/13/2010 12:53 PM

To Andy Crossland, Bonnie Gitlin, Veronica Blette, Stephanie Thornton, Connie Bosma, Holly Galavotti, Kevin Weiss, Allison Wiedeman, Marcus Zobrist, Greg Schaner
cc Deborah Nagle, William Anderson, Randy Hill, Louis Eby
bcc
Subject Fw: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/13

All,

Every year our AA is asked to give an interview to BNA highlighting some of our upcoming work, initiatives, rules, developments, etc. for the coming year. This is part of an "outlook" article they publish each year. I have generated the following draft TPs (all derived from previous speeches, so hopefully, it won't be too onerous a review) for OWM to include.

The topics I included were:

(b) (5)

[REDACTED]

[REDACTED]

If you could please review and provide comments and updates today, I would greatly appreciate it...



ATTACHMENT REDACTED - FOIA (b) (5)

Draft OWM 2011 BNA Outlook Interview Talking Points 12-13-10.docx

**OWM Talking Points for Pete Silva
BNA 2011 OW Outlook Interview
December 13, 2009
DRAFT**

(b) (5)

[REDACTED]

- (b) (5)
- [REDACTED]
- [REDACTED]
- [REDACTED]

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(b) (5)

I

II
III
IV

Karen Gude
U.S. Environmental Protection Agency
OW/OWM/PIRMS - 4201M
1200 Penn. Ave., NW, Room 7102C
Washington, DC 20460
Phone: (202) 564-9567
Fax: (202) 501-2399

----- Forwarded by Karen Gude/DC/USEPA/US on 12/13/2010 12:39 PM -----

From: Jalil Isa/DC/USEPA/US
To: Amy Han/DC/USEPA/US@EPA
Cc: Cara Lalley/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Karen Gude/DC/USEPA/US@EPA, Keara Moore/DC/USEPA/US@EPA, Robert Gunter/DC/USEPA/US@EPA, "Travis Loop" <tloop@chesapeakebay.net>
Date: 12/09/2010 06:00 PM
Subject: Re: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/13

(b) (5)





Thanks,
Jalil Isa
Press Officer
U.S. Environmental Protection Agency
202-564-3226
isa.jalil@epa.gov

Amy Han

Thanks Greg. All, please send what you can by...

12/09/2010 05:10:52 PM

From: Amy Han/DC/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA
Cc: Cara Lalley/DC/USEPA/US@EPA, Jalil Isa/DC/USEPA/US@EPA, Karen Gude/DC/USEPA/US@EPA, Keara Moore/DC/USEPA/US@EPA, Robert Gunter/DC/USEPA/US@EPA, "Travis Loop" <tloop@chesapeakebay.net>
Date: 12/09/2010 05:10 PM
Subject: Re: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/13

Thanks Greg.

All, please send what you can by noon on Monday. (I just changed the date in the subject heading so as not to confuse OW's deadline with OPA's) Schedules are tight on Tuesday and so what we have will need to be reviewed Monday afternoon.

Amy Han
Office Of Water, Communications
U.S. Environmental Protection Agency
phone: 202-564-1196

Gregory Peck

I'll reply to the "Greg or Nancy" Q's.

12/09/2010 04:18:36 PM

From: Gregory Peck/DC/USEPA/US
To: Amy Han/DC/USEPA/US@EPA
Cc: Cara Lalley/DC/USEPA/US@EPA, Jalil Isa/DC/USEPA/US@EPA, Karen Gude/DC/USEPA/US@EPA, Keara Moore/DC/USEPA/US@EPA, Robert Gunter/DC/USEPA/US@EPA, "Travis Loop" <tloop@chesapeakebay.net>, VirginiaD Lee/DC/USEPA/US@EPA
Date: 12/09/2010 04:18 PM
Subject: Re: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/14

I'll reply to the "Greg or Nancy" Q's.

Amy Han

Jalil, we will keep the 12/14 deadline in mind. All...

12/09/2010 03:51:29 PM

From: Amy Han/DC/USEPA/US
To: Jalil Isa/DC/USEPA/US@EPA
Cc: Cara Lalley/DC/USEPA/US@EPA, Karen Gude/DC/USEPA/US@EPA, Keara Moore/DC/USEPA/US@EPA, Robert Gunter/DC/USEPA/US@EPA, "Travis Loop" <tloop@chesapeakebay.net>, Gregory Peck/DC/USEPA/US@EPA, VirginiaD Lee/DC/USEPA/US@EPA
Date: 12/09/2010 03:51 PM
Subject: Re: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/14

Jalil, we will keep the 12/14 deadline in mind.

(b) (5)



(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(b) (5)

Amy Han
Office Of Water, Communications
U.S. Environmental Protection Agency
phone: 202-564-1196

Jalil Isa

We won't be setting up any interviews until 3rd fl...

12/09/2010 01:41:31 PM

From: Jalil Isa/DC/USEPA/US
To: Cara Lalley/DC/USEPA/US@EPA
Cc: Amy Han/DC/USEPA/US@EPA, Karen Gude/DC/USEPA/US@EPA, Keara Moore/DC/USEPA/US@EPA, Robert Gunter/DC/USEPA/US@EPA, "Travis Loop" <tloop@chesapeakebay.net>
Date: 12/09/2010 01:41 PM
Subject: Re: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/14

(b) (5)

Jalil Isa

Sent from BlackBerry. Pardon slow typing.

Cara Lalley

----- Original Message -----

From: Cara Lalley
Sent: 12/09/2010 12:05 PM EST
To: Jalil Isa
Cc: Amy Han; Karen Gude; Keara Moore; Robert Gunter; "Travis Loop" <tloop@chesapeakebay.net>
Subject: Re: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/14
Okay- as soon as you know, please let us know the actual date of the interview (and if we still have to get

you the TPs for review by COB Tuesday). Some of our key folks are out of the office and won't be back until Monday or Tuesday.

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Thanks,

Cara Lalley
Communications Coordinator
Office of Science and Technology, Office of Water
U.S. Environmental Protection Agency
Ph: 202-566-0372
Fax: 202-566-0441

Jalil Isa

We may not have to follow the list of questions to...

12/08/2010 09:14:08 PM

From: Jalil Isa/DC/USEPA/US
To: Amy Han/DC/USEPA/US@EPA, Cara Lalley/DC/USEPA/US@EPA
Cc: "Travis Loop" <tloop@chesapeakebay.net>, Karen Gude/DC/USEPA/US@EPA, Keara Moore/DC/USEPA/US@EPA, Robert Gunter/DC/USEPA/US@EPA
Date: 12/08/2010 09:14 PM
Subject: Re: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/14

(b) (5)

Jalil Isa

Sent from BlackBerry. Pardon slow typing.

Amy Han

----- Original Message -----

From: Amy Han
Sent: 12/08/2010 08:12 PM EST
To: Cara Lalley; Jalil Isa
Cc: "Travis Loop" <tloop@chesapeakebay.net>; Karen Gude; Keara Moore; Robert Gunter

Subject: Re: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/14

Travis met with Nancy on general communications, (b) (5). As of now Pete's schedule is booked for next week. Keara's preparing a list.

I already updated Jalil over the phone, but I'll follow up - is Cynthia's list sufficient for this week?

Cara Lalley

----- Original Message -----

From: Cara Lalley
Sent: 12/08/2010 06:33 PM EST
To: Amy Han
Cc: Travis Loop <tloop@chesapeakebay.net>; Karen Gude; Keara Moore; Robert Gunter

Subject: Fw: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/14

Amy,

You mentioned this morning that someone was having a meeting about this interview today.... (b) (5)

Thanks

Cara Lalley
Communications Coordinator
Office of Science and Technology, Office of Water
U.S. Environmental Protection Agency
Ph: 202-566-0372

Fax: 202-566-0441

----- Forwarded by Cara Lalley/DC/USEPA/US on 12/08/2010 06:31 PM -----

From: Jalil Isa/DC/USEPA/US
To: Peter Silva/DC/USEPA/US@EPA, Cynthia Dougherty/DC/USEPA/US@EPA
Cc: Amy Han/DC/USEPA/US@EPA, Keara Moore/DC/USEPA/US@EPA, Karen Gude/DC/USEPA/US@EPA, Cara Lalley/DC/USEPA/US@EPA, Travis Loop/CBP/USEPA/US@EPA, Robert Gunter/DC/USEPA/US@EPA
Date: 12/07/2010 12:57 PM
Subject: MEDIA INQUIRY: BNA--requests for interview with Water AA--Deadline 12/14

(b) (5)



Here are a few general questions for the Outlook interviews.
My piece will address Clean Water Act issues in 2011.

What are EPA's most significant Clean Water Act priorities and challenges for 2011? Any new focus, program or policy changes?

Clean Water Act jurisdiction. I understand EPA at this point is not ready to make an announcement, eg. whether the agency will issue a rule. However, how will EPA deal with jurisdictional challenges in the coming year? What might be some options? Is a regulation a possibility? Administrator Jackson has called for legislation. However, the chief sponsors were just voted out of office. What are the agency's concerns. Would like some comments on this issue, even if no action is decided yet.

Key Clean Water Act regulations the agency will be working on in 2011 and why they are important. Comments on most significant regulations.
EPA is working on proposing a rule to curb sanitary sewer overflows. Where does this stand. What will EPA be doing on this rule in 2011, and what is being considered?

Comments on status of other regulatory work in 2011, including planned stormwater rule on developed sites; cooling water intake rule; and on just announced planned rule for 2012 on coal-fired power plants.

Nutrients: EPA just issued a big rule setting numeric limits

for nutrients in Florida, which will take some time to implement. Is the agency looking to do the same in some other states, such as those in the Mississippi Basin. Some time ago, I was told EPA was considering a similar move in Wisconsin. What does EPA want to do? Efforts in 2011 to address nonpoint source pollution.

Possible questions for Peter Silva:

What do you see as the primary policy issues in 2011 for drinking water?

Is there much that EPA can do about planning for water quantity (separate from quality) -- for sustainability of supply in the face of increasing demand? This gets mentioned often, but the practical tools at EPA's disposal may be very limited. The WaterSense program, for example--is it making a fundamental difference?

State regulators are increasingly angry at EPA over water regulations and guidance on the permitting of mines, especially mountaintop coal mines. Some of the states say EPA is failing to respect the delegation of Clean Water Act regulatory authority to states. Is EPA digging in and anticipating prolonged fighting with the states, in and out of court? A rockier general relationship with the states?

Does EPA plan a push to use conductivity standards for various pollutants in waters throughout the United States? EPA has been asking the SAB about that. What is EPA's own view about the practical extent of such an approach to measuring various dissolved solids?

There is high anxiety over the draft update of the cancer risk assessment for inorganic arsenic. Any sense yet of what impact that will have on regulations for drinking water?

Possible questions for Cynthia Dougherty:

What do you see as the primary policy issues in 2011 for

drinking water?

An enhanced effort to regulate contaminants in groups rather than individually got started in 2010. How is that likely to go in 2011?
Anything that could be noted as a prominent result of that effort?

So-called "emerging contaminants," including possible endocrine disruptors, draw a lot of attention. Is the research on such subjects inherently too complex and lengthy for us to expect any significant regulatory issues to emerge in 2011, or is there something in that category on the horizon?

There is high anxiety over the draft update of the cancer risk assessment for inorganic arsenic. Any sense yet of what impact that will have on regulations for drinking water?

There is a draft microbial risk assessment guideline planned. There already has been a move toward creating a protocol that was revised and re-labeled and maybe not finished yet as some sort of risk assessment framework. Where is that framework? How will the guideline differ from the framework? And is the guideline coming out in 2011?

Will perchlorate still be a lingering regulatory question in 2011, or will that be over and done with?

Thanks,
Jalil Isa
Press Officer
U.S. Environmental Protection Agency
202-564-3226
isa.jalil@epa.gov

**Alaina
DeGeorgio/R3/USEPA/US**

12/13/2010 02:11 PM

To Jeffrey Lapp, Jessica Martinsen

cc

bcc

Subject Draft Tioga 3 Letter

Jeff and Jessica,

Attached is the most recent draft of the Tioga #3 letter. I am waiting for comments from Maggie on the CMP, as well as any general bullets from Allison. I am still in the process of adding additional bullets to the attachment as well.

Thanks,

Alaina



Tioga3_PN Comments.doc

Attachment Withheld - FOIA (b)(5)

Alaina DeGeorgio
EPA Region III
1650 Arch St.
Philadelphia, PA
(215) 814-2741

Margaret
Passmore/R3/USEPA/US
12/13/2010 02:22 PM

To Frank Borsuk
cc Christopher Hunter, Frank Borsuk, Greg Pond, John Forren,
Palmer Hough, Stefania Shamet
bcc
Subject Re: Comments on Appendix 2 by Frank Borsuk - Re: Fw:
FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

Here are my comments and corrections on Appendix 2.

M



ATTACHMENT REDACTED - DELIBERATIVE

Appendix 2 Water Quality & Wildlife 121010_MP.doc

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
Environmental Assessment and Innovation Division
USEPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
(p) 304-234-0245
(f) 304-234-0260
passmore.margaret@epa.gov

Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Frank Borsuk

[Chris/Palmer: I have redline and inserted comm...](#)

12/13/2010 01:42:58 PM

From: Frank Borsuk/R3/USEPA/US
To: Frank Borsuk/R3/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/13/2010 01:42 PM
Subject: Re: Comments on Appendix 2 by Frank Borsuk - Re: Fw: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

[attachment "Appendix 2 Water Quality & Wildlife 121010 comments by Frank Borsuk 12-13-2010.doc" deleted by Margaret Passmore/R3/USEPA/US]

Chris/Palmer:

I have redline and inserted comments into Appendix 2.

(b) (5)



(b) (5)

Frank

Frank Borsuk, Ph.D.
Aquatic/Fisheries Biologist
Freshwater Biology Team
USEPA-Region 3 (Wheeling Office)
Office of Monitoring & Assessment (3EA50)
Environmental Assessment & Innovation Division
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
304-234-0241 Phone
304-234-0260 Fax
borsuk.frank@epa.gov

Please visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Frank Borsuk

Palmer/Chris: I have reviewed Appendix 4 Selen...

12/13/2010 10:43:00 AM

From: Frank Borsuk/R3/USEPA/US
To: Palmer Hough/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA
Cc: Greg Pond/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, borsuk.frank@epa.gov
Date: 12/13/2010 10:43 AM
Subject: Comments on Appendix 4 by Frank Borsuk - Re: Fw: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

Palmer/Chris:

I have reviewed Appendix 4 Selenium and have the following comments:

I have attached the document with my redline and corrections which were limited. Only one typo on Table A4.1 (croos versus cross section).

(b) (5)

Other than these, it is good.

Frank

Frank Borsuk, Ph.D.
Aquatic/Fisheries Biologist
Freshwater Biology Team
USEPA-Region 3 (Wheeling Office)
Office of Monitoring & Assessment (3EA50)

Environmental Assessment & Innovation Division
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
304-234-0241 Phone
304-234-0260 Fax
borsuk.frank@epa.gov

Please visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

From: Margaret Passmore/R3/USEPA/US
To: Louis Reynolds/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA
Date: 12/13/2010 06:44 AM
Subject: Fw: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

Lou and Frank,

Please find the time to review your sections. Get back directly to Palmer Hough and Chris Hunter and cc me, Greg, John, and Stef.

Thanks

M

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
Environmental Assessment and Innovation Division
USEPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
(p) 304-234-0245
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Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

----- Forwarded by Margaret Passmore/R3/USEPA/US on 12/13/2010 06:39 AM -----

From: Christopher Hunter/DC/USEPA/US
To:

Denise Keehner/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Cliff Rader/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Michael Slimak/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Christine Mazzarella/R3/USEPA/US, Heather Case/DC/USEPA/US@EPA, Tom Lavery/DC/USEPA/US@EPA, Marcus

Zobrist/DC/USEPA/US@EPA

C Palmer Hough/DC/USEPA/US@EPA, Julia McCarthy/R8/USEPA/US@EPA, Marcel Tchaou/DC/USEPA/US@EPA, Ross
c: Geredien/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA, David
Evans/DC/USEPA/US@EPA, Jim Pendergast/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EP

D 12/10/2010 06:15 PM
at

e:

S FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

u
bj
e
ct
:

Hello all,

As promised, attached for your review, please find the draft Appendices for the Spruce No. 1 Surface Mine 404(c) action. These are fairly technical, and I'm not expecting everyone to give me comments, but if you plan to review them, I am requesting **all comments (in redline/strikeout) back to me by COB December 20**. We are still finalizing the other 2 Appendices (Response to Comments and References). These will be reviewed by a smaller group within the next couple of weeks.

I will be out of the office until December 21, but if you have any questions on the draft during the next week, please contact Palmer Hough.

Thanks for your comments on the FD main text,
Chris

[attachment "Appendix 1 Macroinvertebrates 121010.doc" deleted by Frank Borsuk/R3/USEPA/US]
[attachment "Appendix 2 Water Quality & Wildlife 121010.doc" deleted by Frank Borsuk/R3/USEPA/US]
[attachment "Appendix 3 Mitigation 121010.doc" deleted by Frank Borsuk/R3/USEPA/US] [attachment
"Appendix 4 Selenium 121010.doc" deleted by Frank Borsuk/R3/USEPA/US] [attachment "Appendix 5
Cumulative Impacts 121010.doc" deleted by Frank Borsuk/R3/USEPA/US]

Chris Hunter

U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454

hunter.christopher@epa.gov [attachment "Appendix 4 Selenium 121010 - comments by Borsuk
12-13-2010.doc" deleted by Frank Borsuk/R3/USEPA/US]

Matthew
Klasen/DC/USEPA/US
12/13/2010 03:38 PM

To: MichaelG Lee
cc: Kevin Minoli, Gregory Peck
bcc:
Subject: Re: my comments on the revised draft letter for Leeco/Stacy
Branch (LRL-2007-0217 897-0480)

Thanks Mike. As you saw, Greg sent out an updated draft with a few edits in the meantime (without incorporating these).

Greg: Let me know if you'd like me to add in Mike's thoughts now or later.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

MichaelG Lee	Matt, Here are my quick edits/comments on Frid...	12/13/2010 12:51:32 PM
--------------	---	------------------------

From: MichaelG Lee/DC/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Cc: Kevin Minoli/DC/USEPA/US@EPA
Date: 12/13/2010 12:51 PM
Subject: my comments on the revised draft letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Matt,
Here are my quick edits/comments on Friday's version of the Leeco letter. Let me know if you have any questions about this.



xxx14.docx

ATTACHMENT REDACTED - DELIBERATIVE

Matthew Klasen	Here's the most recent draft. mk	12/10/2010 04:58:14 PM
----------------	--	------------------------

From: Matthew Klasen/DC/USEPA/US
To: MichaelG Lee/DC/USEPA/US@EPA
Date: 12/10/2010 04:58 PM
Subject: Fw: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Here's the most recent draft.

mk

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/10/2010 04:58 PM -----

From: Brian Frazer/DC/USEPA/US
To: Stan Meiburg/R4/USEPA/US@EPA
Cc: Duncan Powell/R4/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, KevinH Miller/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Tom Welborn/R4/USEPA/US@EPA
Date: 12/10/2010 01:58 PM
Subject: Re: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Stan - (b) (5) There were three minor edits that is needed for clarity, Here is the last version is entitled 12-10 from me. Thanks

[attachment "2010-12-10 Leeco Draft Closeout Letter khm edits clean.docx" deleted by MichaelG Lee/DC/USEPA/US]

Brian M. Frazer, Chief
Wetlands & Aquatic Resources Regulatory Branch
Office of Wetlands, Oceans and Watersheds
U.S. EPA
1200 Pennsylvania Avenue, NW (MC 4502T)
Washington, DC 20460
202-566-1652

Stan Meiburg

Brian, I read your version you sent this morning...

12/10/2010 01:06:38 PM

From: Stan Meiburg/R4/USEPA/US
To: KevinH Miller/R4/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA
Cc: Duncan Powell/R4/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Tom Welborn/R4/USEPA/US@EPA
Date: 12/10/2010 01:06 PM
Subject: Re: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Brian, I read your version you sent this morning against this one. (b) (5)

Stan

A. Stanley Meiburg
Deputy Regional Administrator
EPA Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303

Office: (404) 562-8357
Fax: (404) 562-9961
Cell: (404) 435-4234
Email: meiburg.stan@epa.gov



Healthier Families, Cleaner Communities, A Stronger America
<http://www.epa.gov/40th>

KevinH Miller

Gentlemen, I have revised the version of the lett...

12/10/2010 11:00:40 AM

From: KevinH Miller/R4/USEPA/US
To: Stan Meiburg/R4/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Tom Welborn/R4/USEPA/US@EPA
Cc: Duncan Powell/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA
Date: 12/10/2010 11:00 AM
Subject: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Gentlemen,

I have revised the version of the letter Matt sent yesterday, as we have discussed. Track changes and clean versions attached.

Please feel free to call me if you have any questions. I will be driving back to Atlanta this afternoon, and working on the special conditions over the weekend.

Thanks, Kevin

Matt, after we spoke, all the things I came across seemed pretty clear, so I went ahead and made changes without the discussion we had planned for noon. But call me if you have any questions, or if you think I have misrepresented anything.

[attachment "2010-12-09 Leeco Draft Closeout Letter khm edits.docx" deleted by Brian Frazer/DC/USEPA/US]

[attachment "2010-12-09 Leeco Draft Closeout Letter khm edits clean.docx" deleted by Brian Frazer/DC/USEPA/US]

Kevin H. Miller
Physical Scientist/Landscape Ecologist
Mining Section/Wetlands, Coastal and Oceans Branch
Water Protection Division/EPA Region 4
Sam Nunn Atlanta Federal Center
Mail Code 9T25/61 Forsyth Street, SW
Atlanta, GA 30303-8960

404.562.9435/404.562.9343 (fax)
miller.kevinh@epa.gov
www.epa.gov/region4/water/wetlands

Matthew
Klasen/DC/USEPA/US
12/13/2010 03:42 PM

To: KevinH Miller
cc
bcc
Subject: Fw: my comments on the revised draft letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Hi Kevin,

See below for OGC comments -- but these are to the older version, not the supplemental edits that Greg sent around recently (reflecting HQ senior management input). I don't think it makes sense to make these edits until the letter content stabilizes, but I'll let you know.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/13/2010 03:42 PM -----

From: MichaelG Lee/DC/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Cc: Kevin Minoli/DC/USEPA/US@EPA
Date: 12/13/2010 12:51 PM
Subject: my comments on the revised draft letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

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xxx14.docx

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Matthew Klasen

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12/10/2010 04:58:14 PM

From: Matthew Klasen/DC/USEPA/US
To: MichaelG Lee/DC/USEPA/US@EPA
Date: 12/10/2010 04:58 PM
Subject: Fw: revised draft final letter for Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Here's the most recent draft.

mk

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/10/2010 04:58 PM -----

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Brian M. Frazer, Chief
Wetlands & Aquatic Resources Regulatory Branch
Office of Wetlands, Oceans and Watersheds
U.S. EPA
1200 Pennsylvania Avenue, NW (MC 4502T)
Washington, DC 20460
202-566-1652

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Date: 12/10/2010 01:06 PM
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Brian, I read your version you sent this morning against this one. (b) (5)

Stan

A. Stanley Meiburg
Deputy Regional Administrator
EPA Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303

Office: (404) 562-8357
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12/10/2010 11:00:40 AM

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Cc: Duncan Powell/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA
Date: 12/10/2010 11:00 AM
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[attachment "2010-12-09 Leeco Draft Closeout Letter khm edits clean.docx" deleted by Brian Frazer/DC/USEPA/US]

Kevin H. Miller
Physical Scientist/Landscape Ecologist
Mining Section/Wetlands, Coastal and Oceans Branch
Water Protection Division/EPA Region 4
Sam Nunn Atlanta Federal Center
Mail Code 9T25/61 Forsyth Street, SW
Atlanta, GA 30303-8960

404.562.9435/404.562.9343 (fax)
miller.kevinh@epa.gov
www.epa.gov/region4/water/wetlands

Ephraim King/DC/USEPA/US

12/13/2010 04:06 PM

To MaryEllen Levine

cc Nancy Stoner, Maryt Smith, Goodwin.Janet

bcc

Subject Fw: (b) (5)

MaryEllen,
let us know if this is OK with you.

thks, ek

Ephraim King
Director
Office of Science & Technology
1200 Pennsylvania Ave., NW
Mail Code 4301T
Washington, DC 20460
Voice: (202) 566-0430
Fax: (202) 566-0441
king.ephraim@epa.gov

----- Forwarded by Ephraim King/DC/USEPA/US on 12/13/2010 04:05 PM -----

From: Janet Goodwin/DC/USEPA/US
To: Ephraim King/DC/USEPA/US@EPA
Cc: MaryEllen Levine/DC/USEPA/US@EPA, Maryt Smith/DC/USEPA/US@EPA, Nancy Stoner/DC/USEPA/US@EPA
Date: 12/13/2010 03:04 PM
Subject: Re (b) (5)

Its attached.



ATTACHMENT REDACTED - DELIBERATIVE

Final draft 304m omb review 121310.DOC

Ephraim King

Jan, Can you please send whatever we plan to s...

12/13/2010 03:01:04 PM

From: Ephraim King/DC/USEPA/US
To: "Janet Goodwin" <Goodwin.Janet@epamail.epa.gov>
Cc: Maryt Smith/DC/USEPA/US@EPA, MaryEllen Levine/DC/USEPA/US@EPA, Nancy Stoner/DC/USEPA/US@EPA
Date: 12/13/2010 03:01 PM
Subject: (b) (5)

Jan,
Can you please send whatever we plan to send to OMB first to MaryEllen ASAP - unless she has already seen and signed off of the SGE language in the notice.

Thks, ek

Sent by EPA Wireless E-Mail Services

David Rider/R3/USEPA/US
12/13/2010 04:28 PM

To Stefania Shamet
cc Christopher Hunter, Frank Borsuk, Greg Pond, John Forren,
Margaret Passmore, Palmer Hough, Regina Poeske
bcc
Subject Selenium additions Re: Help w/ Spruce (sorry)

(b)
(5)
ACP

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

David E. Rider
US Environmental Protection Agency
1650 Arch Street (3EA50)
Philadelphia, PA 19103-2029
215-814-2787

Learn more about the Office of Monitoring & Assessment at <http://epa.gov/reg3esd1/3ea50.htm>

Stefania Shamet

That works, Thanks, Maggie.

12/13/2010 02:27:05 PM

From: Stefania Shamet/R3/USEPA/US
To: Margaret Passmore/R3/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/13/2010 02:27 PM
Subject: Re: Help w/ Spruce (sorry)

That works, Thanks, Maggie.



Margaret Passmore

(b) (5) ACP

12/13/2010 01:09:57 PM

From: Margaret Passmore/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/13/2010 01:09 PM
Subject: Re: Help w/ Spruce (sorry)

(b)(5) ACP

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
Environmental Assessment and Innovation Division
USEPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995

(p) 304-234-0245
(f) 304-234-0260
passmore.margaret@epa.gov

Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Stefania Shamet

(b) (5) ACP

12/13/2010 12:27:43 PM

From: Stefania Shamet/R3/USEPA/US
To: Greg Pond/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA
Cc: Palmer Hough/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA
Date: 12/13/2010 12:27 PM
Subject: Help w/ Spruce (sorry)

(b)(5) ACP

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

Tom Welborn/R4/USEPA/US
12/13/2010 04:31 PM

To Gregory Peck, Bob Sussman, Brian Frazer, Deborah Nagle, Early William, Jim Giattina, John Pomponio, KevinH Miller, Matthew Klasen, MichaelG Lee, Nancy Stoner, Philip Mancusi-Ungaro, Stan Meiburg, Stefania Shamet, Duncan Powell, Chris Thomas, Doug Mundrick

cc

bcc

Subject Revised Leeco Letter Final Draft Leeco/Stacy Branch
(LRL-2007-0217 897-0480)

Here is R4's final draft that will be routed for signature tomorrow. (b) (5)

Please let us know if there are any major outstanding issues and we can discuss on the call tomorrow morning. Thanks for all your help.



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-13 Leeco Draft Closeout Letter clean.docx

Tom Welborn, Chief
Wetlands, Coastal and Oceans Branch
EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303
404-562-9354
404-562-9343(FAX)
404-895-6312(cell)

Gregory Peck/DC/USEPA/US
12/13/2010 04:46 PM

To "Nancy Stoner"
cc
bcc
Subject Fw: Revised Leeco Letter Final Draft Leeco/Stacy Branch
(LRL-2007-0217 897-0480)

Heres a final letter

Gregory E. Peck
Chief of Staff
Office of Water
U.S. E.P.A.
Tom Welborn

----- Original Message -----

From: Tom Welborn
Sent: 12/13/2010 04:31 PM EST
To: Gregory Peck; Bob Sussman; Brian Frazer; Deborah Nagle; William Early;
Jim Giattina; John Pomponio; KevinH Miller; Matthew Klasen; MichaelG Lee;
Nancy Stoner; Philip Mancusi-Ungaro; Stan Meiburg; Stefania Shamet; Duncan
Powell; Chris Thomas; Doug Mundrick
Subject: Revised Leeco Letter Final Draft Leeco/Stacy Branch
(LRL-2007-0217 897-0480)

Here is R4's final draft that will be routed for signature tomorrow. (b) (5)

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2010-12-13 Leeco Draft Closeout Letter clean.docx

Tom Welborn, Chief
Wetlands, Coastal and Oceans Branch
EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303
404-562-9354
404-562-9343(FAX)
404-895-6312(cell)

Gregory Peck/DC/USEPA/US

12/13/2010 04:58 PM

To MichaelG Lee

cc Matthew Klasen

bcc

Subject Fw: Revised Leeco Letter Final Draft Leeco/Stacy Branch
(LRL-2007-0217 897-0480)

Michael:

If you have remaining concerns - send me your comments and I'll make sure they get addressed. Sorry if my edits screwed up getting your comments included.

Thanks,
Greg

----- Forwarded by Gregory Peck/DC/USEPA/US on 12/13/2010 04:57 PM -----

From: Tom Welborn/R4/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA, Bob Sussman/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Early.William@epamail.epa.gov, Jim Giattina/R4/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, KevinH Miller/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Nancy Stoner/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Stan Meiburg/R4/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Duncan Powell/R4/USEPA/US@EPA, Chris Thomas/R4/USEPA/US@EPA, Doug Mundrick/R4/USEPA/US@EPA
Date: 12/13/2010 04:31 PM
Subject: Revised Leeco Letter Final Draft Leeco/Stacy Branch (LRL-2007-0217 897-0480)

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Tom Welborn, Chief
Wetlands, Coastal and Oceans Branch
EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303
404-562-9354
404-562-9343(FAX)
404-895-6312(cell)

Stefania
Shamet/R3/USEPA/US
12/13/2010 04:59 PM

To David Rider
cc Christopher Hunter, Frank Borsuk, Greg Pond, John Forren,
Margaret Passmore, Palmer Hough, Regina Poeske
bcc
Subject Re: Selenium additions Re: Help w/ Spruce (sorry)

Thank you to Dave, Frank & Maggie (b) (5) ACP

David Rider

(b) (5) ACP

12/13/2010 04:28:58 PM

From: David Rider/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/13/2010 04:28 PM
Subject: Selenium additions Re: Help w/ Spruce (sorry)

Stef,

(b)(5) ACP

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(b)(5) ACP



David E. Rider
US Environmental Protection Agency
1650 Arch Street (3EA50)
Philadelphia, PA 19103-2029
215-814-2787

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(b) (5) ACP



12/13/2010 01:09:57 PM

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Date: 12/13/2010 01:09 PM
Subject: Re: Help w/ Spruce (sorry)

(b)(5) ACP



(b)(5) ACP

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
Environmental Assessment and Innovation Division
USEPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
(p) 304-234-0245
(f) 304-234-0260
passmore.margaret@epa.gov

Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Stefania Shamet

As I go through the legal/policy comments -- one...

12/13/2010 12:27:43 PM

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Poeske/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, David
Rider/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA
Date: 12/13/2010 12:27 PM
Subject: Help w/ Spruce (sorry)

(b)(5) ACP

Matthew
Klasen/DC/USEPA/US
12/13/2010 05:36 PM

To Martha Workman
cc Gregory Peck
bcc
Subject Note to Joe Pizarchik

Hi Martha,

Below is the note and attachment to send to Joe Pizarchik at OSM. Let me know if you have any questions.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-13 OSM Follow-Up - Compiled Clean.docx

Matthew
Klasen/DC/USEPA/US
12/13/2010 10:17 PM

To Gregory Peck
cc
bcc
Subject Fw: Revised Leeco Letter Final Draft Leeco/Stacy Branch
(LRL-2007-0217 897-0480)

(b) (5)

mk

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Forwarded by Matthew Klasen/DC/USEPA/US on 12/13/2010 10:16PM

To: Gregory Peck/DC/USEPA/US@EPA, Bob Sussman/DC/USEPA/US@EPA, Brian
Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA,
Early.William@epamail.epa.gov, Jim Giattina/R4/USEPA/US@EPA, John
Pomponio/R3/USEPA/US@EPA, KevinH Miller/R4/USEPA/US@EPA, Matthew
Klasen/DC/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Nancy
Stoner/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Stan
Meiburg/R4/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Duncan
Powell/R4/USEPA/US@EPA, Chris Thomas/R4/USEPA/US@EPA, Doug
Mundrick/R4/USEPA/US@EPA
From: Tom Welborn/R4/USEPA/US
Date: 12/13/2010 04:31PM
Subject: Revised Leeco Letter Final Draft Leeco/Stacy Branch (LRL-2007-0217 897-0480)


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outstanding issues and we can discuss on the call tomorrow morning. Thanks for all your
help.

(See attached file: 2010-12-13 Leeco Draft Closeout Letter clean.docx)

Tom Welborn, Chief
Wetlands, Coastal and Oceans Branch
EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303
404-562-9354

404-562-9343(FAX)

404-895-6312(cell)  - 2010-12-13 Leeco Draft Closeout Letter clean.docx

ATTACHMENT REDACTED - DELIBERATIVE

Nancy Stoner/DC/USEPA/US

12/14/2010 07:27 AM

To Martha Workman

cc

bcc

Subject Fw: (b) (5)

For REVIEW

Janet Goodwin

----- Original Message -----

From: Janet Goodwin

Sent: 12/13/2010 03:04 PM EST

To: Ephraim King

Cc: MaryEllen Levine; Maryt Smith; Nancy Stoner

Subject: Re: (b) (5)

Its attached.



ATTACHMENT REDACTED - DELIBERATIVE

Final draft 304m omb review 121310.DOC

Ephraim King

Jan, Can you please send whatever we plan to s...

12/13/2010 03:01:04 PM

From: Ephraim King/DC/USEPA/US

To: "Janet Goodwin" <Goodwin.Janet@epamail.epa.gov>

Cc: Maryt Smith/DC/USEPA/US@EPA, MaryEllen Levine/DC/USEPA/US@EPA, Nancy Stoner/DC/USEPA/US@EPA

Date: 12/13/2010 03:01 PM

Subject: (b) (5)

Jan,

Can you please send whatever we plan to send to OMB first to MaryEllen ASAP - unless she has already seen and signed off of the SGE language in the notice.

Thks, ek

Sent by EPA Wireless E-Mail Services

David Rider/R3/USEPA/US
12/14/2010 08:46 AM

To Frank Borsuk
cc Stefania Shamet
bcc
Subject Re: Dave - Please review and give comments on the timeline -
Fw: Selenium Timeline -- Re: Help w/ Spruce (sorry)

Frank,

(b) (5) [Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

Dave

David E. Rider
US Environmental Protection Agency
1650 Arch Street (3EA50)

Philadelphia, PA 19103-2029
215-814-2787

Learn more about the Office of Monitoring & Assessment at <http://epa.gov/reg3esd1/3ea50.htm>

Frank Borsuk

Dave: Can you add any additional info for the sel...

12/13/2010 03:46:55 PM

From: Frank Borsuk/R3/USEPA/US
To: David Rider/R3/USEPA/US@EPA
Date: 12/13/2010 03:46 PM
Subject: Dave - Please review and give comments on the timeline - Fw: Selenium Timeline -- Re: Help w/ Spruce (sorry)

Dave:

(b) (5)

Frank

Frank Borsuk, Ph.D.
Aquatic/Fisheries Biologist
Freshwater Biology Team
USEPA-Region 3 (Wheeling Office)
Office of Monitoring & Assessment (3EA50)
Environmental Assessment & Innovation Division
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
304-234-0241 Phone
304-234-0260 Fax
borsuk.frank@epa.gov

Please visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

----- Forwarded by Frank Borsuk/R3/USEPA/US on 12/13/2010 03:46 PM -----

From: Margaret Passmore/R3/USEPA/US
To: Frank Borsuk/R3/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/13/2010 03:14 PM
Subject: Re: Selenium Timeline -- Re: Help w/ Spruce (sorry)

Very nice start, Frank. Thank you.

(b) (5)

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
Environmental Assessment and Innovation Division
USEPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
(p) 304-234-0245

(f) 304-234-0260
passmore.margaret@epa.gov

Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Frank Borsuk

(b)(5) ACP

12/13/2010 03:07:06 PM

From: Frank Borsuk/R3/USEPA/US
To: Margaret Passmore/R3/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/13/2010 03:07 PM
Subject: Selenium Timeline -- Re: Help w/ Spruce (sorry)

(b)(5) ACP




Frank

Frank Borsuk, Ph.D.
Aquatic/Fisheries Biologist
Freshwater Biology Team
USEPA-Region 3 (Wheeling Office)
Office of Monitoring & Assessment (3EA50)
Environmental Assessment & Innovation Division
1060 Chapline Street, Suite 303

Wheeling, WV 26003-2995
304-234-0241 Phone
304-234-0260 Fax
borsuk.frank@epa.gov

Please visit our website at <http://epa.gov/reg3esd1/3ea50.htm>



Margaret Passmore

(b) (5) ACP

12/13/2010 01:09:58 PM

From: Margaret Passmore/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/13/2010 01:09 PM
Subject: Re: Help w/ Spruce (sorry)

(b)(5) ACP

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
Environmental Assessment and Innovation Division
USEPA Region 3
1060 Chapline Street, Suite 303
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passmore.margaret@epa.gov

Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Stefania Shamet

(b) (5) ACP

12/13/2010 12:27:43 PM

From: Stefania Shamet/R3/USEPA/US
To: Greg Pond/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA
Cc: Palmer Hough/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA
Date: 12/13/2010 12:27 PM
Subject: Help w/ Spruce (sorry)

(b)(5) ACP

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

Brian Topping/DC/USEPA/US
12/14/2010 09:10 AM

To Gregory Peck
cc David Evans, Brian Frazer, Ross Geredien, Matthew Klasen
bcc
Subject Fw: Revised Leeco Letter

Greg,
Here are some mostly minor edits in redline and spelled out below. Let us know when the latest set of conditions are ready.
Thanks,
Brian

----- Forwarded by Brian Topping/DC/USEPA/US on 12/14/2010 09:07 AM -----

From: Brian Topping/DC/USEPA/US
To: Brian Frazer/DC/USEPA/US@EPA
Cc: Ross Geredien/DC/USEPA/US@EPA
Date: 12/14/2010 08:39 AM
Subject: Re: Fw: Revised Leeco Letter

Brian,
(b) (5)

[REDACTED]



ATTACHMENT REDACTED - DELIBERATIVE

Leeco Stacy Branch Comment Letter gep DEC 13 10_bt.docx

Brian Topping
US Environmental Protection Agency
Wetlands Division, Room 7231
Office: 202-566-5680, FAX: 202-566-1375
Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460
Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004
topping.brian@epa.gov

Brian Frazer

FYI - Attached below is the current version of the...

12/13/2010 02:42:00 PM

From: Brian Frazer/DC/USEPA/US
To: Denise Keehner/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA
Date: 12/13/2010 02:42 PM

Subject: Fw: Revised Leeco Letter

FYI - Attached below is the current version of the Leeco letter edited by Greg.

(b) (5)



bf

Brian M. Frazer, Chief
Wetlands & Aquatic Resources Regulatory Branch
Office of Wetlands, Oceans and Watersheds
U.S. EPA
1200 Pennsylvania Avenue, NW (MC 4502T)
Washington, DC 20460
202-566-1652

----- Forwarded by Brian Frazer/DC/USEPA/US on 12/13/2010 02:36 PM -----

From: Gregory Peck/DC/USEPA/US
To: Nancy Stoner/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, Stan Meiburg/R4/USEPA/US@EPA, Tom Welborn/R4/USEPA/US@EPA, Bob Sussman/DC/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, KevinH Miller/R4/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Early.William@epamail.epa.gov
Date: 12/13/2010 02:34 PM
Subject: Revised Leeco Letter

(b) (5)




[attachment "Leeco Stacy Branch Comment Letter gep DEC 13 10.docx" deleted by Brian Topping/DC/USEPA/US]

Gregory E. Peck
Chief of Staff
Office of Water
U.S. Environmental Protection Agency

Matthew
Klasen/DC/USEPA/US
12/14/2010 09:12 AM

To Gregory Peck
cc Brian Frazer, Brian Topping, David Evans, Ross Geredien
bcc
Subject Re: Fw: Revised Leeco Letter

There's actually an updated draft of the letter that R4 sent out last night. I need to check with R4 on an issue with that version, and I'll pass these along.

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Gregory Peck

Thanks Brian.

12/14/2010 09:11:34 AM

From: Gregory Peck/DC/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA
Cc: Brian Frazer/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA
Date: 12/14/2010 09:11 AM
Subject: Re: Fw: Revised Leeco Letter

Thanks Brian.

Brian Topping

Greg, Here are some mostly minor edits in redli...

12/14/2010 09:10:12 AM

From: Brian Topping/DC/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA
Cc: David Evans/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA
Date: 12/14/2010 09:10 AM
Subject: Fw: Revised Leeco Letter

Greg,
Here are some mostly minor edits in redline and spelled out below. Let us know when the latest set of conditions are ready.
Thanks,
Brian

----- Forwarded by Brian Topping/DC/USEPA/US on 12/14/2010 09:07 AM -----

From: Brian Topping/DC/USEPA/US
To: Brian Frazer/DC/USEPA/US@EPA
Cc: Ross Geredien/DC/USEPA/US@EPA
Date: 12/14/2010 08:39 AM
Subject: Re: Fw: Revised Leeco Letter

(b)
(5)
[REDACTED]

(b) (5)

[attachment "Leeco Stacy Branch Comment Letter gep DEC 13 10_bt.docx" deleted by Gregory Peck/DC/USEPA/US]

Brian Topping
US Environmental Protection Agency
Wetlands Division, Room 7231
Office: 202-566-5680, FAX: 202-566-1375
Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460
Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004
topping.brian@epa.gov

Brian Frazer

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12/13/2010 02:42:00 PM

From: Brian Frazer/DC/USEPA/US
To: Denise Keehner/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA
Date: 12/13/2010 02:42 PM
Subject: Fw: Revised Leeco Letter

FYI - Attached below is the current version of the Leeco letter edited by Greg.

(b) (5)

bf

Brian M. Frazer, Chief
Wetlands & Aquatic Resources Regulatory Branch
Office of Wetlands, Oceans and Watersheds
U.S. EPA
1200 Pennsylvania Avenue, NW (MC 4502T)
Washington, DC 20460
202-566-1652

----- Forwarded by Brian Frazer/DC/USEPA/US on 12/13/2010 02:36 PM -----

From: Gregory Peck/DC/USEPA/US
To: Nancy Stoner/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, Stan Meiburg/R4/USEPA/US@EPA, Tom Welborn/R4/USEPA/US@EPA, Bob Sussman/DC/USEPA/US@EPA, John

Pomponio/R3/USEPA/US@EPA, KevinH Miller/R4/USEPA/US@EPA, Stefania
Shamet/R3/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Philip
Mancusi-Ungaro/R4/USEPA/US@EPA, Early.William@epamail.epa.gov

Date:
Subject:

12/13/2010 02:34 PM
Revised Leeco Letter

(b) (5)



[attachment "Leeco Stacy Branch Comment Letter gep DEC 13 10.docx" deleted by Brian
Topping/DC/USEPA/US]

Gregory E. Peck
Chief of Staff
Office of Water
U.S. Environmental Protection Agency

Matthew
Klasen/DC/USEPA/US
12/14/2010 09:42 AM

To Gregory Peck
cc
bcc
Subject Draft note to Bob re: Coal Mac / Stacy Branch

Here's a shot at a note to Bob.

mk

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

(b)
(5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



CoalMac_ECP_letter_06-21-10.pdf



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Colonel Robert D. Peterson
District Engineer
Huntington District
U.S. Army Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701

JUN 21 2010

Dear Colonel Peterson:

The U.S. Environmental Protection Agency (EPA) has been participating in discussions with your staff and with representatives of Coal-Mac Inc. (applicant) to seek resolution of concerns expressed by EPA regarding the proposed Pine Creek Surface Mine. Pine Creek Surface Mine is one of the remaining sixteen projects located in West Virginia and identified for the enhanced coordination procedures (ECP) established in the Memorandum of Understanding (MOU) signed by our respective agencies and the Department of Interior on June 11, 2009. The 60-day ECP timeframe for resolution of issues surrounding this project began on April 6, 2010 and expired on June 4, 2010. EPA sent a letter requesting a 15 day extension for review of the project; that extension expires on June 19, 2010.

On April 1, 2010, EPA released interim final guidance to the Regional offices titled: *Guidance on Improving EPA Review of Appalachian Surface Coal Mining Operations under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order* (SCM Guidance). The SCM Guidance clarifies EPA's regulations as they apply to discharges associated with surface coal mining practices and provides a framework for the Regions when they review permits for discharges associated with Appalachian surface mining projects. EPA Region III utilized the regulations and this Guidance during its review of the Coal Mac proposal. EPA recently also released two Office of Research and Development (ORD) reports: *The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields*, and *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams (Benchmark Conductivity Study)*. The ORD reports are being submitted to the EPA Science Advisory Board (SAB) for review and are also publicly available. In the interim, EPA views the reports as providing information, along with published, peer-reviewed scientific literature, that may inform permit reviews.

During the project review process as provided by the June 11, 2009 Memorandum to the Field, EPA identified four areas of general concern. These included avoidance and minimization, water quality impacts, cumulative effects, and mitigation. The project as proposed by Coal-Mac Inc. will impact 14,530 linear feet of stream channel and disturb 759 surface acres. The streams on-site are good quality and are providing clean, freshwater dilution to the Left Fork of Pine Creek. We commend Coal-Mac for its efforts to address EPA's concerns based on our



regulations and clarified by the SCM Guidance. EPA believes that a permit decision may move forward consistent with the application as modified by this letter.

Avoidance and Minimization

The applicant performed a comprehensive alternatives analysis as part of the original application. Through the applicant's upfront efforts impacts to 22% of the stream resources within the project area were avoided. The applicant proposes to haul approximately 4.1 million tons of material to the adjacent mine (Pheonix No. 4 Surface Mine). The applicant proposes to raise the deck of the valley fills 100 feet beyond that which is required by the West Virginia Approximate Original Contour/Fill Optimization process. Where practicable the applicant has maximized the amount of spoil returned to the mine bench and minimized the amount of excess spoil that must be disposed of in streams. Following the initiation of the ECP process, the applicant evaluated alternatives in valley fill construction and has incorporated best management practices that are expected to reduce the likelihood of increased loading of total dissolved solids (TDS) and specific conductivity levels to minimize water quality impacts and protect against significant degradation of downstream aquatic resources. These include a materials handling plan to minimize exposure of mineral-rich overburden to surface waters and groundwater, and modification of fill construction to maximize surface water runoff and minimize infiltration of water through the fill.

In addition, the applicant has modified the mine plan in an effort to minimize the amount of land disturbed at any one point in time during the operation. The original plan proposed to have the full mine area disturbed and all three valley fills active within 12-18 months of commencing operation. The revised mine plan proposes the concurrent use of Valley Fills 1 and 3 within approximately 6 months, but represents a reduction of surface acres of disturbance at any point in time during operation by up to 25% within one year of operation. The applicant's proposal would delay the use of Valley Fill 2 until approximately 3 years from the beginning of the operation. While the applicant's efforts in this regard are appreciated, the proposal essentially calls for concurrent construction of Valley Fills 1 and 3. As set forth in more detail below, EPA recommends that the three valley fills be constructed sequentially, with earlier valley fills fully constructed and monitored prior to initial construction of subsequent fills to ensure that predicted water quality outcomes are achieved.

Water Quality and Significant Degradation

To address the Agency's water quality concerns, the applicant has proposed to incorporate Best Management Practices recommended in the April 1 SCM Guidance. Based on peer-reviewed studies examining the relationship between conductivity and water quality impairment in Appalachia, EPA anticipates that projects with predicted conductivity levels below 300 $\mu\text{S}/\text{cm}$ generally will not cause a water quality standard violation or significant degradation of the aquatic ecosystem. However, EPA expects that in-stream conductivity levels above 500 $\mu\text{S}/\text{cm}$ are likely to be associated with adverse impacts that could rise to a level of significant degradation of the aquatic ecosystem. EPA has not been provided any information regarding site-specific conditions that differ from those studies. The Corps, EPA and the applicant have worked to develop protective permit conditions to ensure in-stream specific conductivity remains at levels that will not cause or contribute to degradation to water quality, including setting threshold limits within the permit of 300 $\mu\text{S}/\text{cm}$ and 500 $\mu\text{S}/\text{cm}$, sequential construction of the



valley fills as described in the SCM Guidance document; a demonstration that specific conductivity at the monitoring locations remains on average below 500 $\mu\text{S}/\text{cm}$ before the commencement of the next valley fill may begin.

To support this demonstration, a supplemental enhanced monitoring plan has been included with the project proposal as described in the applicant's Supplemental Monitoring and Adaptive Management Plan document. The applicant has agreed to monitor for physical, biological, and chemical parameters. The chemical parameters that will be monitored include, but are not limited to flow, pH, iron, manganese, aluminum, selenium, TDS, total suspended solids (TSS), sulfates, chlorides and specific conductivity.

The applicant proposes two conductivity thresholds for adaptive management. The first is at 300 $\mu\text{S}/\text{cm}$. If the linear trend in the twice-monthly monitoring data indicates an exceedance of 300 $\mu\text{S}/\text{cm}$ below Valley Fill 1 and/or Valley Fill 3, the applicant will implement an adaptive management plan (AMP) to address the trend. The second threshold is at 500 $\mu\text{S}/\text{cm}$. The applicant proposes that, if a linear trend in twice-monthly monitoring indicates an exceedance of 500 $\mu\text{S}/\text{cm}$ below Valley Fill 1, the applicant will provide additional mitigation focused on chemical improvements in the watershed. With respect to construction of Valley Fills 1 and 3, the applicant proposes to commence construction of Valley Fill 1 and to demonstrate that the average conductivity values downstream of Valley Fill 1 remain below 500 $\mu\text{S}/\text{cm}$ within six months from construction of Pond 1 or after the construction of the first three lifts within Valley Fill 1, whichever period of time is longer. The applicant proposes that, if the foregoing condition is achieved, the applicant be authorized to proceed with construction of Valley Fill 3. If the foregoing condition is not achieved, the applicant proposes that it would not be authorized to proceed with construction of Valley Fill 3 until and unless successful remediation occurs. With respect to construction of Valley Fill 2, the applicant proposes to monitor both Valley Fills 1 and 3 during construction and demonstrate that average conductivity values downstream of both fills have remained below 500 $\mu\text{S}/\text{cm}$. If this condition is achieved, construction of Valley Fill 2 may proceed. Under this scenario, the applicant anticipates a period of three years between construction of Pond 1 and commencement of construction of Valley Fill 2. The applicant would not be allowed to proceed to Valley Fill 2 until and unless successful remediation occurs.

While the applicant's proposal attempts to address the Agency SCM Guidance, EPA remains concerned that the proposal essentially calls for concurrent construction of Valley Fills 1 and 3. The applicant has not demonstrated that the anticipated approximate 6 month period between construction of Pond 1 and commencement of construction at Valley Fill 3 is a sufficient monitoring period to meaningfully evaluate impacts from Valley Fill 1. For that reason, EPA recommends that each proposed valley fill be constructed to its completion and monitored over a period of time to evaluate whether significant degradation is occurring. This would allow for a comprehensive demonstration that Valley Fill 1 is consistent with the conductivity benchmark of 500 $\mu\text{S}/\text{cm}$ included in the SCM Guidance and will not result in significant degradation in the receiving streams. Accordingly, EPA recommends that only Valley Fill 1 be authorized immediately using previously agreed-upon underdrain and landscape best management practices. Authorization of only Valley Fill 1 allows for time to assess the effects of removing the contribution of dilution waters with low conductivity to the Left Fork of Pine Creek where conductivity levels approach 500 $\mu\text{S}/\text{cm}$. The data from Valley Fill 1 should be utilized to determine whether to authorize remaining valley fills.



Mitigation

The applicant has proposed on-site stream restoration and creation of 40,000+ linear feet of stream (greater than 2:1 ratio). The plan includes a significant monitoring plan and benchmarks for success, an adaptive management plan that provides back up plans if the projects are unsuccessful and provides for upfront financial assurances. The applicant's benchmarks of success include biological, chemical and physical measures and are intended to replace the lost functions within the immediate watershed. The primary goal of these created stream channels is to become functioning stream channels that meet Clean Water Act requirements and meet the State's designated use for aquatic life. EPA believes the proposed mitigation is consistent with CWA regulations and the considerations provided in the April 1 SCM Guidance document.

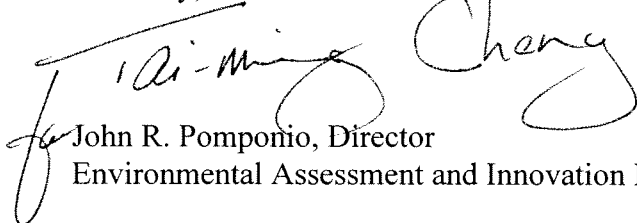
Cumulative Impacts

To address cumulative impacts, the applicant has offered to deed restrict three areas previously permitted to be filled on the Phoenix No. 5 Surface Mine operation. The Phoenix No. 5 operation was authorized to construct 5 valley fills. Two valley fills have been constructed. The applicant will deed restrict the three remaining unfilled sites. Those areas will therefore not be subject to filling now or in the future. This is an avoidance of impacts to 3,900 linear feet of stream channel and represents a 39.5% reduction of impacts within the Pine Creek watershed. The average conductivity values for these three streams are below 350 $\mu\text{S}/\text{cm}$ and West Virginia Stream Condition Index scores greater than 85, indicating a very good biological community. In addition, the applicant has proposed to provide mitigation concurrently with the mining operation focused on improving the water quality through the reduction of TDS in the immediate watershed. There currently exists 4 deep mine discharges that are contributing to the loading of TDS on Left Fork of Pine Creek, and on Pine Creek, that the applicant is evaluating and is proposing to address.

EPA believes that a permit decision may move forward consistent with the application as modified by the Supplemental Monitoring and Adaptive Management Plan and as further modified by this letter. Incorporation of these modifications into enforceable conditions is recommended. EPA requests that we have the opportunity to review and comment on the draft permit and special conditions prior to finalization.

EPA appreciates the work your staff and Coal-Mac Inc. have undertaken to address the Agency's concerns. We look forward to continuing coordination as the permit is finalized. If you have any questions please don't hesitate to contact me or Jeff Lapp of my staff at 215-814-2717.

Sincerely,

A handwritten signature in black ink, appearing to read "John R. Pomponio", is written over the typed name and title.

John R. Pomponio, Director
Environmental Assessment and Innovation Division



Matthew
Klasen/DC/USEPA/US
12/14/2010 09:52 AM

To Tom Welborn
cc KevinH Miller, Jim Giattina, Stan Meiburg
bcc
Subject Re: Revised Leeco Letter Final Draft Leeco/Stacy Branch
(LRL-2007-0217 897-0480)

Hi Tom,

(b) (5)

[REDACTED]

Thanks,
Matt



ATTACHMENT REDACTED - DELIBERATIVE

Adaptive mangement -- GEP edits.docx

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Tom Welborn

Here is R4's final draft that will be routed for sign...

12/13/2010 04:31:21 PM

From: Tom Welborn/R4/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA, Bob Sussman/DC/USEPA/US@EPA, Brian
Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA,
Early.William@epamail.epa.gov, Jim Giattina/R4/USEPA/US@EPA, John
Pomponio/R3/USEPA/US@EPA, KevinH Miller/R4/USEPA/US@EPA, Matthew
Klasen/DC/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Nancy
Stoner/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Stan
Meiburg/R4/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Duncan
Powell/R4/USEPA/US@EPA, Chris Thomas/R4/USEPA/US@EPA, Doug
Mundrick/R4/USEPA/US@EPA
Date: 12/13/2010 04:31 PM

Subject: Revised Leeco Letter Final Draft Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Here is R4's final draft that will be routed for signature tomorrow. (b) (5)

Please let us know if there are any major outstanding issues and we can discuss on the call tomorrow morning. Thanks for all your help.

[attachment "2010-12-13 Leeco Draft Closeout Letter clean.docx" deleted by Matthew Klasen/DC/USEPA/US]

Tom Welborn, Chief
Wetlands, Coastal and Oceans Branch
EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303
404-562-9354
404-562-9343(FAX)
404-895-6312(cell)

Matthew
Klasen/DC/USEPA/US
12/14/2010 09:54 AM

To Brian Topping, Ross Geredien
cc David Evans, Brian Frazer
bcc
Subject Fw: Revised Leeco Letter Final Draft Leeco/Stacy Branch
(LRL-2007-0217 897-0480)

Brian and Ross:

See below for the updated Leeco letter from R4 yesterday. I sent along your edits a moment ago to Greg's version.

Note that the special conditions are attached to this version; we should talk with R4 at 10:30 about how we coordinate review of that section. I reviewed it last night and things generally seemed consistent with the letter.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/14/2010 09:53 AM -----

From: Tom Welborn/R4/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA, Bob Sussman/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Early.William@epamail.epa.gov, Jim Giattina/R4/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, KevinH Miller/R4/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Nancy Stoner/DC/USEPA/US@EPA, Philip Mancusi-Ungaro/R4/USEPA/US@EPA, Stan Meiburg/R4/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Duncan Powell/R4/USEPA/US@EPA, Chris Thomas/R4/USEPA/US@EPA, Doug Mundrick/R4/USEPA/US@EPA
Date: 12/13/2010 04:31 PM
Subject: Revised Leeco Letter Final Draft Leeco/Stacy Branch (LRL-2007-0217 897-0480)

Here is R4's final draft that will be routed for signature tomorrow. (b) (5)

Please let us know if there are any major outstanding issues and we can discuss on the call tomorrow morning. Thanks for all your help.



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-13 Leeco Draft Closeout Letter clean.docx

Tom Welborn, Chief
Wetlands, Coastal and Oceans Branch
EPA Region 4
61 Forsyth Street, SW

Atlanta, GA 30303
404-562-9354
404-562-9343(FAX)
404-895-6312(cell)

Michael
Moeykens/CI/USEPA/US
12/14/2010 10:41 AM

To David Kargbo
cc Brent Johnson, Ronald Landy
bcc
Subject Re: Fw: Region 5 comments on RESer Proposal

Dave,

Here is the Effects of Mountaintop Mines paper -

U.S. (Environmental Protection Agency) (2009) The effects of mountaintop mines and valley fills on aquatic ecosystems of the central Appalachian coalfields. External Review Draft. U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA 600/R-09/138A. Available online at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=215267#Download>

NCEA has also put together a conductivity guidance document that is of import to mining activities you might be interested in, it can be found below.

U.S. (Environmental Protection Agency) (2010) A field-based aquatic life benchmark for conductivity in central Appalachian streams. External Review Draft. U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA 600/R-10/0023A. Available online at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=220171#Download>

Regards.

~~~~~  
Michael D. Moeykens, Ph.D.  
Aquatic Biologist  
USEPA  
ERB/EERD/NERL/ORD/USEPA  
26 West MLK Dr.  
Cincinnati, OH 45268

513-569-7196  
[moeykens.michael@epa.gov](mailto:moeykens.michael@epa.gov)  
~~~~~

David Kargbo

Michael; Sorry I was out of the office yesterday a...

12/11/2010 02:37:00 PM

From: David Kargbo/R3/USEPA/US
To: Michael Moeykens/CI/USEPA/US@EPA
Cc: Brent Johnson/CI/USEPA/US@EPA, Ronald Landy/ESC/R3/USEPA/US@EPA
Date: 12/11/2010 02:37 PM
Subject: Re: Fw: Region 5 comments on RESer Proposal

Michael;
Sorry I was out of the office yesterday and just getting to emails on REServ today. The addition you suggested will be great. Can you send me a copy of the report?

Dave.

Re: Fw: Region 5 comments on RESer Proposal

Re: Fw: Region 5 comments on RESer Proposal 

Michael Moeykens to: Ronald Landy

12/10/2010 02:10 PM

Cc: Brent Johnson, David Kargbo

Ron et. al,

We have a very recent document we can tie the MTM/VF to negative effects, The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields. The report shows "MTM-VF lead directly to five principal alterations of stream ecosystems: (1) springs, intermittent streams, and small perennial streams are permanently lost with the removal of the mountain and from burial under fill, (2) concentrations of major chemical ions are persistently elevated downstream, (3) degraded water quality reaches levels that are acutely lethal to standard laboratory test organisms, (4) selenium concentrations are elevated, reaching concentrations that have caused toxic effects in fish and birds and (5) macroinvertebrate and fish communities are consistently and significantly degraded."

I am sure we can add something in.

~~~~~  
Michael D. Moeykens, Ph.D.  
Aquatic Biologist  
USEPA  
ERB/EERD/NERL/ORD/USEPA  
26 West MLK Dr.  
Cincinnati, OH 45268

513-569-7196  
moeykens.michael@epa.gov  
~~~~~

Ronald Landy	Mike and Brent	See the highlighted bullet. I...	12/10/2010 08:50:46 AM
--------------	----------------	----------------------------------	------------------------

**Matthew
Klasen/DC/USEPA/US**
12/14/2010 12:18 PM

To Jim Pendergast, Ross Geredien, Elaine Suriano, Brian
Frazer, MichaelG Lee, Justin Wright, Sharmin Syed, Js
Wilson
cc Denise Keehner, David Evans, Gregory Peck
bcc
Subject Fw: EPA follow-up to our 11/23 stream protection rule policy
meeting

Hi everyone,

See attached below for the proposed regulatory text that Nancy sent to OSM yesterday on the draft stream protection rule.

Elaine: Nancy's cover note did include a paragraph requesting an update on a chapter 3 reconciliation meeting and on the regulatory impact analysis. Hopefully we'll get an update on this at this afternoon's monthly CEQ meeting.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

ATTACHMENT REDACTED - DELIBERATIVE



2010-12-13 OSM Follow-Up - Compiled Clean.docx

Greg Pond/R3/USEPA/US

12/14/2010 12:48 PM

To Christopher Hunter

cc Brian Topping, Julia McCarthy, Ross Geredien, Stefania Shamet, Regina Poeske

bcc

Subject Re: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

Here are my comments on Appendix 1 and Appendix 3. Kudos to you all--I like what you added/changed/re-organized. (b) (5)

Note that in App. 3, I changed virtually nothing and only made 1 or 2 edits. In App. 1, I made some edits and added a some language and updated calculations that I think got lost in earlier correspondence.



Appendix 3 Mitigation 121010_GP.doc



Appendix 1 Macroinvertebrates 121010_GP.doc

Greg Pond
Office of Monitoring and Assessment
U.S. EPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
(p) 304-234-0243
(f) 304-234-0260
pond.greg@epa.gov
Website: <http://epa.gov/reg3esd1/3ea50.htm>

ATTACHMENTS REDACTED - DELIBERATIVE

Christopher Hunter

Hello all, As promised, attached for your review,...

12/10/2010 06:16:05 PM

From: Christopher Hunter/DC/USEPA/US
To: Denise Keehner/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Cliff Rader/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Michael Slimak/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Christine Mazzarella/R3/USEPA/US, Heather Case/DC/USEPA/US@EPA, Tom Lavery/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA
Cc: Palmer Hough/DC/USEPA/US@EPA, Julia McCarthy/R8/USEPA/US@EPA, Marcel Tchaou/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Jim Pendergast/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EP
Date: 12/10/2010 06:16 PM
Subject: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

Hello all,

As promised, attached for your review, please find the draft Appendices for the Spruce No. 1 Surface Mine 404(c) action. These are fairly technical, and I'm not expecting everyone to give me comments, but if you plan to review them, I am requesting **all comments (in redline/strikeout) back to me by COB December 20**. We are still finalizing the other 2 Appendices (Response to Comments and References). These will be reviewed by a smaller group within the next couple of weeks.

I will be out of the office until December 21, but if you have any questions on the draft during the next week, please contact Palmer Hough.

Thanks for your comments on the FD main text,

Chris

[attachment "Appendix 1 Macroinvertebrates 121010.doc" deleted by Greg Pond/R3/USEPA/US]
[attachment "Appendix 2 Water Quality & Wildlife 121010.doc" deleted by Greg Pond/R3/USEPA/US]
[attachment "Appendix 3 Mitigation 121010.doc" deleted by Greg Pond/R3/USEPA/US] [attachment
"Appendix 4 Selenium 121010.doc" deleted by Greg Pond/R3/USEPA/US] [attachment "Appendix 5
Cumulative Impacts 121010.doc" deleted by Greg Pond/R3/USEPA/US]

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454
hunter.christopher@epa.gov

Gregory Peck/DC/USEPA/US
12/14/2010 12:56 PM

To Kevin Minoli, MichaelG Lee
cc
bcc
Subject Leeco

(b) (5) ACP

I didn't do track changes.

Thanks



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-14 Leeco Draft Closeout Letter clean gep v3.docx

Stefania
Shamet/R3/USEPA/US
12/14/2010 02:11 PM

To David Rider
cc
bcc
Subject Fw: FOR YOUR REVIEW: Draft Spruce 404(c) Final
Determination

----- Forwarded by Stefania Shamet/R3/USEPA/US on 12/14/2010 02:08 PM -----

FOR YOUR REVIEW: Draft Spruce 404(c) Final Determination

Denise Keehner, Gregory Peck, Cliff Rader, Matthew
Klasen, Charles Lee, Suzi Ruhl, Kevin Minoli, Karyn
Wendelowski, Michael Slimak, Stefania Shamet, John
Christopher Hunter to: Pomponio, Regina Poeske, Greg Pond, Margaret 12/01/2010 11:02 AM
Passmore, Jim Giattina, Tom Welborn, Tinka Hyde,
Peter Swenson, Christine Mazzarella, Heather Case,
Tom Laverty, Marcus Zobrist

Cc: Palmer Hough, Julia McCarthy, Marcel Tchaou, Ross Geredien, Brian Frazer,
Brian Topping, David Evans, Jim Pendergast, Tanya Code

Hello all,
Attached for your review, please find our draft Final Determination for the Spruce No. 1 Surface Mine
404(c) action. Now that the consultation period with the permittee has ended, we will need to move
quickly toward finalizing this document, so I am requesting **all comments on this draft (in redline/strikeout)
back to me by COB December 8**. At the end of next week, I will be sending the draft technical appendices
for your review as well. Following comment review, we will be preparing a revised draft of the main body
text and start the briefings for upper management. At the moment, we are planning for a publication and
communications rollout for the Final Determination just after the New Year, possibly January 7, 2011.

I will be out of the office until December 9, but if you have any questions on the draft during the next week,
please contact Palmer Hough.

Thank you,
Chris

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454



ATTACHMENT REDACTED - DELIBERATIVE

hunter.christopher@epa.gov Spruce FD draft 120110.doc

Kevin Minoli/DC/USEPA/US
12/14/2010 02:12 PM

To Gregory Peck
cc
bcc
Subject Re: Leeco

(b)(5) ACP

t.



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-14 Leeco Draft Closeout Letter clean gep v3.ksm.docx

Gregory Peck

Can you look at this quickly to see if it effectively...

12/14/2010 12:56:04 PM

From: Gregory Peck/DC/USEPA/US
To: Kevin Minoli, MichaelG Lee/DC/USEPA/US@EPA
Date: 12/14/2010 12:56 PM
Subject: Leeco

(b) (5) ACP

I didn't do track changes.

Thanks

[attachment "2010-12-14 Leeco Draft Closeout Letter clean gep v3.docx" deleted by Kevin Minoli/DC/USEPA/US]

Jessica
Martinsen/R3/USEPA/US

12/14/2010 02:51 PM

To Alaina DeGeorgio

cc

bcc

Subject Hobet 45 Stream re-establishment

These are the conditions from the permit. (b) (5)

A large rectangular area of the document is redacted with a solid black box, covering several lines of text.

Habitat Assessment Scores

- Proposed mitigation areas will be evaluated for United State Environmental Protection Agency Rapid Bioassessment Protocol habitat assessment values (HAV). Data derived from HAV will be used as a comparison to baseline data to determine if the proposed mitigation measures have resulted in an overall increase in the HAV as shown in the CMP and its supplements referenced in Special Condition 9.

Biotic Success

- Proposed intermittent/perennial mitigation areas shall achieve benthic macroinvertebrates communities and the WVSCI consistent with or better than the baseline provided in the CMP and its supplements referenced in Special Condition 9.

Water Quality

- Proposed perennial and intermittent mitigation shall achieve water chemistry consistent with or better than baseline data as shown in the CMP and its supplements referenced in Special Condition 9. Proposed perennial and intermittent mitigation shall not contain levels of TDS, TSS, specific conductivity, iron, aluminum, manganese or selenium greater than baseline data as shown in the CMP and its supplements referenced in Special Condition 9.

Jessica Martinsen
U.S. EPA Region III
Office of Environmental Programs
1650 Arch St. (3EA30)
Philadelphia, PA 19103
215-814-5144 (office)
215-814-2783 (fax)

Brian Topping/DC/USEPA/US

12/14/2010 05:31 PM

To Palmer Hough

cc

bcc

Subject Fw: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

FYI

----- Forwarded by Brian Topping/DC/USEPA/US on 12/14/2010 05:32 PM -----

From: Greg Pond/R3/USEPA/US
To: Christopher Hunter/DC/USEPA/US@EPA
Cc: Brian Topping/DC/USEPA/US@EPA, Julia McCarthy/R8/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/14/2010 12:48 PM
Subject: Re: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

Here are my comments on Appendix 1 and Appendix 3. Kudos to you all--I like what you added/changed/re-organized. (b) (5)

Note that in App. 3, I changed virtually nothing and only made 1 or 2 edits. In App. 1, I made some edits and added some language and updated calculations that I think got lost in earlier correspondence.



Appendix 3 Mitigation 121010_GP.doc



Appendix 1 Macroinvertebrates 121010_GP.doc

ATTACHMENTS REDACTED - DELIBERATIVE

Greg Pond
Office of Monitoring and Assessment
U.S. EPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
(p) 304-234-0243
(f) 304-234-0260
pond.greg@epa.gov
Website: <http://epa.gov/reg3esd1/3ea50.htm>

Christopher Hunter Hello all, As promised, attached for your review,...

12/10/2010 06:16:05 PM

From: Christopher Hunter/DC/USEPA/US
To: Denise Keehner/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Cliff Rader/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Michael Slimak/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Christine Mazzarella/R3/USEPA/US, Heather Case/DC/USEPA/US@EPA, Tom Laverty/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA
Cc: Palmer Hough/DC/USEPA/US@EPA, Julia McCarthy/R8/USEPA/US@EPA, Marcel Tchaou/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Jim Pendergast/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EP
Date: 12/10/2010 06:16 PM
Subject: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

Hello all,

As promised, attached for your review, please find the draft Appendices for the Spruce No. 1 Surface Mine 404(c) action. These are fairly technical, and I'm not expecting everyone to give me comments, but if you plan to review them, I am requesting **all comments (in redline/strikeout) back to me by COB December 20**. We are still finalizing the other 2 Appendices (Response to Comments and References). These will be reviewed by a smaller group within the next couple of weeks.

I will be out of the office until December 21, but if you have any questions on the draft during the next week, please contact Palmer Hough.

Thanks for your comments on the FD main text,
Chris

[attachment "Appendix 1 Macroinvertebrates 121010.doc" deleted by Greg Pond/R3/USEPA/US]
[attachment "Appendix 2 Water Quality & Wildlife 121010.doc" deleted by Greg Pond/R3/USEPA/US]
[attachment "Appendix 3 Mitigation 121010.doc" deleted by Greg Pond/R3/USEPA/US] [attachment
"Appendix 4 Selenium 121010.doc" deleted by Greg Pond/R3/USEPA/US] [attachment "Appendix 5
Cumulative Impacts 121010.doc" deleted by Greg Pond/R3/USEPA/US]

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454
hunter.christopher@epa.gov

Matthew
Klasen/DC/USEPA/US
12/14/2010 06:50 PM

To "Morris, Cynthia (ENRD)", "Amaditz, Kenneth (ENRD)"
cc Karyn Wendelowski, Kevin Minoli
bcc
Subject Re: FW: NMA Call to Discuss PI Hearing

Ken and CJ:

(b) (5) ACP [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Thanks,
Matt



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-14 ECP and SAB Summary for DOJ.docx

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Brian Topping/DC/USEPA/US

12/15/2010 09:53 AM

To

cc

bcc

Subject Mining Long Term Prep Discussion

Meeting

Date 12/15/2010

Time 01:00:00 PM to 01:30:00 PM

Chair Brian Topping

Invitees

Required Brian Frazer

Optional Marcel Tchaou; Ross Geredien

FYI

Location Brian's office



ATTACHMENT REDACTED - DELIBERATIVE

LongTermStrategy.docx

Agenda for Thursday's meeting attached. Also current draft of the comparison spreadsheet attached - further updates will still be occurring today. It prints nicely on a 11 x 17 paper which I will bring to tomorrow's meeting.



ATTACHMENT REDACTED - DELIBERATIVE

Mining-Analysis_12-9-10.xlsx

Ross
Geredien/DC/USEPA/US
12/15/2010 01:02 PM

To: Brian Topping
cc
bcc
Subject: Re: Fw: Mountaintop Mining update

Thanks, I'll be over in a second

Here's a factsheet for SAB.



ATTACHMENT REDACTED - DELIBERATIVE

SAB Review of ORD Studies.docx

Ross Geredien
ORISE Fellow
EPA Office of Wetlands, Oceans, and Watersheds
202-566-1466
Geredien.ross(AT)epa.gov

Brian Topping

Ross, Here are your general numbers. Just put...

12/15/2010 12:57:34 PM

From: Brian Topping/DC/USEPA/US
To: Ross Geredien/DC/USEPA/US@EPA
Date: 12/15/2010 12:57 PM
Subject: Fw: Mountaintop Mining update

Ross,
Here are your general numbers. Just put these in factsheet form and leave blanks for the substance of the comments to be filled in later.
Thanks,
Brian

Brian Topping
US Environmental Protection Agency
Wetlands Division, Room 7231
Office: 202-566-5680, FAX: 202-566-1375
Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460
Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004
topping.brian@epa.gov

----- Forwarded by Brian Topping/DC/USEPA/US on 12/15/2010 12:56 PM -----

From: Geraldine Camilli <gcamilli@horsleywitten.com>
To: Brian Topping/DC/USEPA/US@EPA
Cc: Richard Claytor <rclaytor@horsleywitten.com>, Thomas Noble <tnoble@horsleywitten.com>, Christopher Hunter/DC/USEPA/US@EPA
Date: 12/15/2010 12:09 PM
Subject: Mountaintop Mining update

Hi Brian:

Per your request to Rich Claytor, please find below information on the status of the mountaintop mining

public comments.

The docket closed to the public on December 1st, and the docket is still uploading comments to the system. As of this morning, approximately 750 comments had been uploaded. Based on what we have processed so far, less than half of the comments (approximately 300) are substantively unique, the balance being modified mass mailers. The docket has identified 8 mass mailing campaigns so far, with two in opposition to the guidance, the remainder in general support and with very similar language. I would guess that less than 50 comments have been submitted by commenters other than the general public. Please keep in mind that the docket continues to upload comments on a daily basis, so the numbers above are an approximation. We are still in the process of downloading, reading, and processing comments.

Please let me know if you have any questions.

Best Regards,
Geraldine

Geraldine Camilli
Civil and Environmental Engineer
Horsley Witten Group
90 Route 6A, Sandwich, MA 02563
508-833-6600
www.horsleywitten.com

Matthew
Klasen/DC/USEPA/US
12/15/2010 01:38 PM

To Stefania Shamet
cc Evelyn MacKnight
bcc
Subject Re: Fw: Rahall incoming re: EPA 402 actions in
Appalachia/WV (requesting R3 draft answers by COB Friday)

(b) (5)

Thanks,
Matt



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-15 Draft Rahall Response.docx

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Stefania Shamet	Can you send us your draft boilerplate please?	12/15/2010 09:41:15 AM
-----------------	--	------------------------

From: Stefania Shamet/R3/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Cc: Evelyn MacKnight/R3/USEPA/US@EPA
Date: 12/15/2010 09:41 AM
Subject: Re: Fw: Rahall incoming re: EPA 402 actions in Appalachia/WV (requesting R3 draft answers by COB Friday)

Can you send us your draft boilerplate please?

Matthew Klasen	Ev and Stef, Just wanted to check in to see whe...	12/15/2010 07:35:04 AM
----------------	--	------------------------

From: Matthew Klasen/DC/USEPA/US
To: Evelyn MacKnight/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/15/2010 07:35 AM
Subject: Fw: Rahall incoming re: EPA 402 actions in Appalachia/WV (requesting R3 draft answers by COB Friday)

Ev and Stef,

Just wanted to check in to see whether the Friday timeline for the Rahall question responses will work for you? (b) (5)

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Forwarded by Matthew Klasen/DC/USEPA/US on 12/14/2010 11:51PM -----

To: Evelyn MacKnight/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
From: Matthew Klasen/DC/USEPA/US
Date: 12/14/2010 08:48AM
Cc: Denis Borum/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Diane Jones-Coleman/DC/USEPA/US@EPA, Jon Capacasa/R3/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Tom Lavery/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA, Sharmin Syed/DC/USEPA/US@EPA, Js Wilson/DC/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA
Subject: Rahall incoming re: EPA 402 actions in Appalachia/WV (requesting R3 draft answers by COB Friday)

Evelyn and Stef:

The Administrator received a letter from Chairman Rahall last week regarding EPA's actions in reviewing Section 402 permits in Appalachia, and asking specific questions about the review process in WV. The letter is attached below, and is in CMS under control # AL-10-002-0308.

(b) (5)



I'd like to see whether R3 could pull together draft responses to these questions by **COB Friday (12/18)** so that we can coordinate review among HQ and R4 early next week, and meet the 12/24 response date. Please let me know if this is a problem. We can discuss this on the mining call at 10:30 if there are any questions.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

(See attached file: 10-002-0308 - Rahall NPDES Incoming.pdf)

Rahall Questions (copied and pasted from the letter):

- What criteria or considerations are used in concurring or objecting to a state-issued permit? To what extent are conductivity or total dissolved solids part of the consideration? What communication is involved with the applicant, and with outside groups?
- How does the Region III office and EPA headquarters interact during the review process? Who directs the review? What authority does each office have to object to the decisions of the other?

- How many objections (interim, general, and specific) has the EPA raised with Sec. 402 permits in West Virginia? How many other 402 permits are likely to raise objections by EPA?
- What is the timeline for resolving these objections? What arrangements might be established to expedite an application? What arrangements might be established to expedite resolution of any dispute(s) over an application? What are you doing to simplify and expedite the process? What progress have you made?

By document 110-000-0000 - Public Notice - comments on the draft permit application

**Alaina
DeGeorgio/R3/USEPA/US**

12/15/2010 02:21 PM

To Jeffrey Lapp, Jessica Martinsen, Stefania Shamet

cc Allison Graham

bcc

Subject Tioga #3 Surface Mine Draft Comments

Hello everyone,

Attached is the latest version of the Tioga #3 Surface Mine. It incorporates all of the comments received to date by this group and from the folks in Wheeling. If you have any corrections, changes, comments please let me know. Thanks for reviewing this draft!

Thanks,

Alaina



Document Withheld - FOIA (b)(5)

Tioga3_PN Comments.doc

Alaina DeGeorgio
EPA Region III
1650 Arch St.
Philadelphia, PA
(215) 814-2741

Carrie Traver/R3/USEPA/US

12/15/2010 04:07 PM

To Marcel Tchaou

cc Regina Poeske, Stefania Shamet, Christopher Hunter, Ross Geredien, Palmer Hough, Margaret Passmore, Greg Pond

bcc

Subject Re: Fw: References Cited for Spruce

Hi Marcel,

I'm checking in to see what information you may need for Spruce. We had done some coordination regarding the references with Chris Hunter, so I'm not sure if you're looking for something additional or different.

Appendix 5 listed references cited and used in the Proposed and Recommended Determinations. Links for online references were furnished in Appendix 5 (attached) and pdfs of references can be found on the Environmental Science Connector at: Spruce Mine Data and References \ RD Final and Appendices \ Final RD References -PDF folder.

After the RD was finalized, we realized that some of the citations needed to be corrected or added from the Appendices. They are listed in the attached Reference Additions document.

The references should all be available as pdfs or links except for the following:

- 4 books that were cited, which are: Stein, B. A., Kutner, L., & Adams, J. (Eds.) (2000) *Precious Heritage, the status of biodiversity in the United States*; Green, N. B., & Pauley, T. K. (1987). *Amphibians and reptiles in West Virginia*; Petranka, J. W. (1998). *Salamanders of the United States and Canada*; and Wells, J. V. (2007). *Birder's Conservation Handbook: 100 North American Birds at Risk*.
- A copy of Vesper, D., Roy, M., & Rhoads, C. L. (2008) is not on the ESC, but can be obtained from ScienceDirect at: <http://www.sciencedirect.com>
- Webster & Benfield 1986 was cited but not include on the reference list. Greg Pond supplied this document directly to HQ.

If there is some information missing or you need anything further, please let me know.

Regards,
Carrie



Reference additions.doc



ATTACHMENT REDACTED - DELIBERATIVE

Appendix 5 final.doc

Carrie Traver
USEPA Region 3
Office of Environmental Programs
1650 Arch Street - 3EA30
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Jessica Martinsen

Passing this along as an FYI. Thought the refer...

12/10/2010 11:52:36 AM

From: Jessica Martinsen/R3/USEPA/US
To: Regina Poeske/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Carrie Traver/R3/USEPA/US@EPA
Date: 12/10/2010 11:52 AM
Subject: Fw: References Cited for Spruce

Passing this along as an FYI. Thought the references were complete. So maybe this is just for HQ folks that may have looked at new things. I just don't know. Thanks!

Jessica Martinsen
U.S. EPA Region III
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1650 Arch St. (3EA30)
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215-814-2783 (fax)

----- Forwarded by Jessica Martinsen/R3/USEPA/US on 12/10/2010 09:49 AM -----

From: Marcel Tchaou/DC/USEPA/US
To: Jessica Martinsen/R3/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA, Julia McCarthy/R8/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Timothy Landers/DC/USEPA/US@EPA
Date: 12/09/2010 08:50 AM
Subject: References Cited for Spruce

Dear All,
I am working on ensuring that we have all references cited at hand. Please send me the list of reference that you used and have in either hard copy or electronic format.
Thanks

Marcel K. Tchaou, Ph.D., P.E., P.H.
Environmental Engineer
Wetlands & Aquatic Resources Regulatory Branch
Office of Wetlands, Oceans and Watersheds
U.S. EPA
1200 Pennsylvania Avenue, NW (MC 4502T)
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APPENDIX 5

References

- Abrams, M.D. (1992). Fire and the development of oak forests in eastern North America. *BioScience*, 42, 346-352.
- Adams, S.M., & Hackney, C.T. (1992). Ecological processes in southeastern United States aquatic ecosystems. In C. T. Hackney, S. M. Adams, & W. H. Martin (Eds.), *Biodiversity of the Southeastern United States: Aquatic Communities*. New York: John Wiley & Sons, Inc.
- Adams, W. J., Toll, J. E., Brix, K. V., Tear, L. M., & DeForest, D. K. (2000). *Site-specific approach for setting water quality criteria for Selenium: differences between lotic and lentic systems*. Williams Lake, BC. Proceedings of Mine Reclamation Symposium; 2000 Jun 19-22, 231-241.
- Ahern, M. M., Mullett, M., MacKay, K., & Hamilton, C. (2010). Residence in Coal-Mining Areas and Low-Birth-Weight Outcomes. *Maternal and Child Health Journal*, DOI 10.1007/s10995-009-0555-1.
- Alexander, R. B. et al. (2009). Dynamic modeling of nitrogen losses in river networks unravels the coupled effects of hydrological and biogeochemical processes. *Biogeochemistry*, 93, 91–116.
- American Bird Conservancy. (2009.) Mountaintop Removal/Valley Fill Coal Mining Impacts on Birds. Retrieved December 29, 2009 from: <http://www.abcbirds.org/conservationissues/threats/energyproduction/mountaintop.html>.
- Amichev, B.Y., Burger, J. A., & Rodrigue, J. A. (2008). Carbon sequestration by forests and soils on mined land in the Midwestern and Appalachian coalfields of the US. *Forest Ecology Management* 256, 1949-1959.
- Andrle, R. F., & Carroll, J. R. (1988.) *The atlas of breeding birds in New York State*. Ithaca: Cornell University Press.
- Anderson, M. G., Merrill, M. D., & Biasi, F. D. (1998). *Connecticut River Watershed Analysis: Ecological communities and neo-tropical migratory birds. Final report summary to USGS Biological Resources Division*. The Nature Conservancy, Boston MA. 36pp.
- Appalachian Mountains Joint Venture (AMJV). (2007). *Implementation plan for the Appalachian Mountains Joint Venture: a foundation for all-bird conservation in the region*. 87 pp. <http://www.amjv.org/>
- Armstead, M. Y., Yaeger-Seagle, J., & Emerson, L. (2004). *Benthic macroinvertebrate studies conducted in mountaintop mining/valley fill influenced streams in conjunction with the USEPA Environmental Impact Study*. Presented at the 2004 National Meeting of the American Society of Mining and Reclamation and the 25th West Virginia Surface Mine Drainage Task Force, April 18-24, 2004. Lexington: ASMR.
- Armstead, M. Y. (2006). *Status of the Industry Understanding of the Effects of Mountaintop Mining and Valley Fills on Aquatic Resources*. Report prepared by Potesta & Associates, Inc. for Jackson & Kelly, PLLC, Charleston, WV.
- Askins, R. A. (1993). Population trends in grassland, shrubland, and forest birds in eastern North America. *Current Ornithology* 11, 1-34.
- Bailey, B. (1999). *Social and economic impacts of wild harvested products*. Ph. D. Dissertation, West Virginia University. Morgantown, WV.
- Baker, J. W., Grover, J. P., Ramachandranair, R., Black, C., Valenti Jr., T. W., Brooks, B. W., & Roelke, D. L. (2009). Growth at the edge of the niche: an experimental study of the harmful alga *Prymnesium parvum*. *Limnology and Oceanography* 54,1679-1687.

- Baker, J.W., Grover, J. P., Brooks, B. W., Urena-Boeck, F., Roelke, D. L., Errera, R. (2007). Growth and toxicity of *Prymnesium parvum* (haptophyta) as a function of salinity light and temperature. *Journal of Phycology*, 43, 219–227.
- Barber-James, H. M., Gattolliat, J., Sartori, M., & Hubbard, M. D. (2008). Global diversity of mayflies (Ephemeroptera, Insecta) in freshwater. *Hydrobiologia*, 595, 339-350.
- Barbour, M. T., Gerritsen, J., Snyder, B. D., & Stribling, J. B. (1999). *Rapid Bioassessment Protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish, second edition*. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C. <http://www.epa.gov/owow/monitoring/rbp/>
- Barbour, R. W., & Davis, W. H. (1974). *Mammals of Kentucky*. Lexington: University of Kentucky Press.
- Barrett, J. W. (1995). *Regional silviculture of the United States*. New York: John Wiley & Sons.
- Bauernfeind, E., & Moog O. (2000). Mayflies (Insecta: Ephemeroptera) and the assessment of ecological integrity: a methodological approach. *Hydrobiologia*, 422/423, 71-83.
- Beketov, M. A. (2004). Different sensitivities of mayflies (Insecta, Ephemeroptera) to ammonia, nitrite and nitrate: linkage between experimental and observational data. *Hydrobiologia*, 528, 209-216.
- Bernhardt, E. S., & Palmer, M. A. (2007). Restoring streams in an urbanizing world. *Freshwater Biology*, 52, 738–751.
- Bernhardt, E. S., et al. (2007). Restoring rivers one reach at a time: Results from a survey of U.S. river restoration practitioners. *Restoration Ecology*, 15, 482–493.
- Bevier, L. R. (1994). *The atlas of breeding birds of Connecticut*. State Geologic and Natural History Survey of Connecticut. Bulletin 113.
- Bonta, J. V., & Dick, W. A. (2003). Impact of coal surface mining and reclamation on surface water chemical concentrations and load rates in three Ohio watersheds. *Journal of the American Water Resources Association*, 39(4), 793-816.
- Bishop, K., Buffam, I., Erlandsson, M., Fölster, J., Laudon, H., Seibert, J., & Temnerud, J. (2008) *Aqua Incognita: the unknown headwaters*. *Hydrological Processes*, 22, 1239–1242.
- Bray, J. R., & Gorham, E. (1964). Litter production in forests of the world. *Advanced Ecological Restoration*, 2, 101-157.
- Brewer, R., McPeck, G. A., & Adams, Jr. R. J. (1991). *The atlas of breeding birds of Michigan*. East Lansing: Michigan State University Press.
- Brinkman, S. F., & Johnston, W. D. (2008). Acute toxicity of aqueous copper, cadmium, and zinc to the mayfly *Rhithrogena hageni*. *Archives of Environmental Contamination and Toxicology*, 54, 466-472.
- Brittain, J. E., & Saltveit, S. J. (1989). Review of effect of river regulation on mayflies (Ephemeroptera). *Regulated Rivers Research and Management*, 3, 191-204. <http://onlinelibrary.wiley.com/doi/10.1002/rrr.3450030119/abstract>
- Brooks, R. T. (2009). Potential impacts of global climate change on the hydrology and ecology of ephemeral freshwater systems of the forests of the northeastern United States. *Climatic Change*, (95), 469–483.
- Brown, P., Cabarle B., & Livernash R.. (1997). *Carbon Counts: Estimating Climate Change Mitigation in Forestry Projects*. Washington, DC: World Resources Institute.

- Bryant, G., McPhilliamy, S., & Childers H. (2002). *A survey of the water quality of streams in the primary region of mountaintop/valley fill coal mining October 1999 to January 2001*. In U.S. Environmental Protection Agency, Mid Atlantic Region, Mountaintop Mining Environmental Impact Statement, Appendix D, Stream chemistry final report, 102 p. <http://www.epa.gov/region03/mtntop/eis2005.htm>
- Bryce, S. A., Omernik J. M., & Larsen D. P. (1999). Ecoregions - a geographic framework to guide risk characterization and ecosystem management. *Environmental Practice* 1(3), 141-155.
- Bucklelew Jr., A. R., & Hall, G. A. (1994). *The West Virginia Breeding Bird Atlas*. Pittsburgh: University of Pittsburgh Press.
- Buehler, D. A., et al. (2008). Cerulean warbler reproduction, survival, and models of population decline. *Journal of Wildlife Management*, 72, 646-653.
- Buffington, J. M., Kilgo, J.C., Sargent, R. A., Miller, K. V., & Chapman, B. R. (1997). Comparison of breeding bird communities in bottomland hardwood forests of different successional stages. *Wilson Bulletin*, 109(2), 314-319.
- Bulluck, L. P. (2007). *Golden-winged warbler (Vermivora chrysoptera) demographics and habitat use and the potential effects of land use change on golden-winged and cerulean warblers (Dendroica cerulea) in the Cumberland Mountains of Tennessee*. Ph.D. Dissertation, University of Tennessee, Knoxville. 200 pp.
- Burton, T. M. (1976). An analysis of the feeding ecology of the salamanders (Amphibia, Urodela) of the Hubbard Brook experimental forest, New Hampshire. *Journal of Herpetology*, 10, 187-284.
- Burton, T. M., & Likens, G. E. (1975). Salamander populations and biomass in Hubbard Brook Experimental Forest, New Hampshire. *Copeia*, 1975, 541-546.
- Buss, D. F., & Salles, F. F. (2007). Using Baetidae species as biological indicators of environmental degradation in a Brazilian River basin. *Environmental Monitoring and Assessment*, 130, 365-372.
- Canterbury, R.A. (2002). *Mountaintop removal and valley-fill mining environmental impact study: bird populations along edges*. Draft Report 2001. Final 2002. Concord College, Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, Pennsylvania. <http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Caruso, B. S. & Haynes, J. (2010). Connectivity and jurisdictional Issues for Rocky Mountains and Great Plains aquatic resources. *Wetlands*. DOI 10.1007/s13157-010-0084-0
- Casas, J. J., et al. (2000). The effect of a headwater dam on the use of leaf bugs by invertebrate communities. *Regulated Rivers Research and Management*, 16, 577-591.
- Center for Biological Diversity (CBD). (2010). Petition to list the eastern-small footed bat (*Myotis leibii*) and northern long-eared bat (*Myotis septentrionalis*) as threatened or endangered under the Endangered Species Act. Center for Biological Diversity, Richmond, VT. 61 pp.
- Chadwick, M. A., Hunter, H., Feminella, J. W., & Henry, R. P. (2002). Salt and water balance in *Hexagenia limbata* (Ephemeroptera: Ephemeridae) when exposed to brackish water. *Florida Entomologist*, 85(4), 650-651.
- Chambers, D. B., & Messinger, T. (2001). *Benthic invertebrate communities and their responses to selected environmental factors in the Kanawha River Basin, West Virginia, Virginia, and North Carolina*. Water-Resources Investigations Report 01-4021, Department of the Interior, U.S. Geological Survey, Charlestown, WV. <http://pubs.usgs.gov/wri/wri014021/>

- Chapman, P. M., et al. (2009). *Ecological assessment of selenium in the aquatic environment: Summary of a SETAC Pellston Workshop*. Pensacola: Society of Environmental Toxicology and Chemistry (SETAC).
<http://www.setac.org/sites/default/files/SELSummary.pdf>
- Clarke, A., Mac Nally, R. Bond, N., & Lake, P. S. (2008). Macroinvertebrate diversity in headwater streams: a review. *Freshwater Biology*, 53, 1707–1721.
- Clements, W. H. (1994). Benthic invertebrate community responses to heavy metals in the upper Arkansas River Basin, Colorado. *Journal of the North American Benthological Society*, 19, 30-44.
- Clements, W. H. (2004). Small-scale experiments support causal relationships between metal contamination and macroinvertebrate community response. *Ecological Applications*, 14, 954-967.
- Clements, W. H., Cherry, D. S., & Van Hassel, J. H. (1992). Assessment of the impact of heavy metals on benthic communities at the Clinch River (Virginia): evaluation of an index of community sensitivity. *Canadian Journal of Fisheries and Aquatic Science*, 49, 1686-169.
- Collins, et al. (2007). Subsurface flowpaths in a forested headwater stream harbor a diverse macroinvertebrate community. *Wetlands*, 27(2).
- Conant, R., & Collins, J. T. (1991). *A Field Guide to Reptiles and Amphibians: Eastern and Central North America*, 3rd Ed. Boston: Houghton Mifflin.
- Conley, J. M., Funk, D. H., & Buchwalter, D. B. (2009). Selenium bioaccumulation and maternal transfer in the mayfly *Centroptilum triangulifer* in a life-cycle, periphyton-biofilm trophic assay. *Environmental Science & Technology*, 43, 7952-7957.
- Courtney, L. A., & Clements, W. H. (2000). Sensitivity to acidic pH in benthic invertebrate assemblages with different histories of metal exposure. *Journal of the North American Benthological Society*, 19, 112-127.
- Courtney, L. A., & Clements, W. H. (2002). Assessing the influence of water and substratum quality on benthic macroinvertebrate communities in a metal-polluted stream: an experimental approach. *Freshwater Biology*, 47, 1766–1778.
- Cummins, K. W. (1973). Trophic relations of aquatic insects. *Annual Review of Entomology* 18, 183-206.
- Cummins, K. W. (1980). The natural stream ecosystem, pp. 7-24. In J.V. Ward and J.A. Stanford (Eds). *The ecology of regulated streams*. New York: Plenum Press.
- Cummins, K. W., & Klug, M. J. (1979). Feeding ecology of stream invertebrates. *Annual Review of Ecology, Evolution, and Systematics*, 10, 147-172.
- Daugherty, C. "Priority Delivery: 2008WVImpairedStreams.zzz". E-mail message to Christine Mazzarella. 30 July, 2009.
- DeBruyn, A., Chapman, M. H., & Chapman, P. M. (2007). Selenium toxicity to invertebrates: will proposed thresholds for toxicity to fish and birds also protect their prey? *Environmental Science & Technology*, 41, 1766-1770.
- Delcourt, P. A., & Delcourt, H. R. (1998). The influence of human-set fires on oak-chestnut forests in the southern Appalachians. *Castanea*, 63, 337-345.
- Delucchi, C. M. (1988). Comparison of community structure among streams with different temporal flow regimes. *Canadian Journal of Zoology*, 66, 579-586.

- Diamond, J., & Daley, C. (2000). What is the relationship between whole effluent toxicity results and biological condition? *Environmental Toxicology and Chemistry*, 19, 158-168.
- Diamond, J., Daley, C., & Moore, T. (1999). *Evaluating whole effluent toxicity testing as an indicator of instream biological conditions*. Alexandria (VA): Water Environment Research Foundation. 95-HHE-1. Available from www.werf.org
- Dickens, P. S., Minear, R. A., & Tschantz, B. A. (1989). Hydrologic alteration of mountain watersheds from surface mining. *Research Journal of the Water Pollution Control Federation*, 61, 1249-1260.
- Diehl, S.F., Goldhaber, M.B., Koenig, A.E., Tuttle, M.L.W., & Ruppert, L.F. (2005) *Concentration of arsenic, selenium, and other trace elements in Appalachian coals of Alabama and Kentucky*. Presented at the 2005 National Meeting of the American Society of Mining and Reclamation, June 19-23, 2005. Published by ASMR, Lexington, KY.
- Doppelt, B. (1993). *Entering the Watershed: a New Approach to Save America's River Ecosystems*. Washington, D.C.: Island Press.
- Eaton, S. W. (1958). A life history study of the Louisiana Waterthrush. *Wilson Bulletin*, 70, 210-235. *Ecological Applications* 17(4): 1156-1167.
- Echols, B. S., Currie, R. J., & Cherry, D. S. (2009, November 4). Preliminary results of laboratory toxicity tests with the mayfly, *Isonychia bicolor* (Ephemeroptera: Isonychiidae) for development as a standard test organism for evaluating streams in the Appalachian coalfields of Virginia and West Virginia. *Environmental Monitoring and Assessment*. [Electronic version].
- Echternacht, A. C., & Harris, L. D. (1993). The fauna and wildlife of the southeastern United States. In W. H. Martin, G. Boyce & A. C. Echternacht (Eds.), *Biodiversity of the Southeastern United States, Volume 1*. (pp. 81-116). New York: John Wiley & Sons.
- Elmore, A. J., & Kaushal, S. S. (2008). Disappearing headwaters: patterns of stream burial due to urbanization. *Frontiers in Ecology and the Environment*, 6, DOI:10.1890/070101.
- Feminella, J. W. (1996). Comparison of benthic macroinvertebrate assemblages in small streams along a gradient of flow permanence. *Journal of the North American Benthological Society*, 15, 651-669.
- Ferrari, J. R., Lookingbill, T. R., McCormick, B., Townsend, P. A., & Eshelman, K. N. (2009). Surface mining and reclamation effects on flood response of watersheds in the central Appalachian Plateau region. *Water Resources Research* 45:W04407.
- Ferreri, C. P., Stauffer, J. R., & Stecko, T. D. (2004). *Evaluating impacts of mountain top removal/valley fill coal mining on stream fish populations*: Proceedings of a joint conference, 21st Annual Meeting of the American Society of Mining and Reclamation and 25th West Virginia Surface Mine Drainage Task Force, April 18-24, 2004. Morgantown, WV. Published by ASMR, p. 576-592.
- Février L., Martin-Garin, A., & Leclerc, E. (2007). Variation of the distribution coefficient (K_d) of selenium in soils under various microbial states. *Journal of Environmental Radioactivity*, 97 (2-3), 189-205.
- Fischenich, J. C. (2006). *Functional Objectives for Stream Restoration*. EMRPP Technical Notes Collection. U.S. Army Corps of Engineers, Engineer Research and Development Center. Vicksburg, MS.
- Ford, C.R., & Vose, J.M. (2007). *Tsuga canadensis* (L.) Carr. mortality will impact hydrologic processes in southern Appalachian forest ecosystems. *Ecological Applications*, 17(4), 1156-1167.

- Freeman M. C., Pringle, C. M., & Jackson, C. R. (2007). Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales. *Journal of the American Water Resources Association*, 43, 5–14.
- Freund, J. G., & Petty, J. T. (2007). Response of fish and macroinvertebrate bioassessment indices to water chemistry in a mined Appalachian watershed. *Environmental Management*. DOI 10.1007/s00267-005-0116-3.
- Fritz, K. M., Fulton, S., Johnson, B. R., Barton, C. D., Jack, J. D., Word, D. A., & Burke, R. A. (2010). Structural and functional characteristics of natural and constructed channels draining a reclaimed mountaintop removal and valley fill coal mine. *Journal of the North American Benthological Society*, 29(2), 673–689.
- Fritz, K. M., Johnson, B. R., & Walters, D. W. (2006). *Field Operations Manual for Assessing the Hydrological Permanence and Ecological Condition of Headwater Streams*. EPA/600/R-06/126. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.
<http://www.epa.gov/eerd/manual/headwater/HISSmanual-cover.pdf>
- Fritz, K. M., Johnson, B. R., & Walters, D. M. (2008). Physical indicators of hydrologic permanence in forested headwater streams. *Journal of the North American Benthological Society*, 27, 690-704.
- Fry, J. A., Coan, M. J., Homer, C. G., Meyer, D. K., & Wickham, J. D. (2009). *Completion of the National Land Cover Database (NLCD) 1992–2001 Land Cover Change Retrofit product*. U.S. Geological Survey Open-File Report 2008–1379, 18 p.
- Fulk, F., Autrey, B., Hutchens, J., Gerritsen, J., Burton, J., Cresswell, C., & Jessup, B. (2003). *Ecological assessment of streams in the coal mining region of West Virginia using data collected by the U.S. EPA and environmental consulting firms*. National Exposure Research Laboratory, US Environmental Protection Agency, Cincinnati, Ohio. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, Pennsylvania.
<http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Gerritsen, J., Burton, J., & Barbour, M. T. (2000). *A stream condition index for West Virginia wadeable streams*. Tetra Tech, Inc., Owings Mills, MD.
- Gill, J. D. (1975). Comparison of seven forest types for game in West Virginia. *Journal of Wildlife Management*, 39, 762-768.
- Gingerich, G. A. (2009). *Quantifying changes in ecological function of headwater catchments following large-scale surface mining in southern West Virginia*. M.S. Thesis. West Virginia University, Morgantown WV.
- Goetsch, P. A., & Palmer, C. G. (1997). Salinity tolerances of selected macroinvertebrates of the Sabie River, Kruger National Park, South Africa. *Archives of Environmental Contamination and Toxicology*, 32, 32-41.
- Gosz, J. R., Holmes, R. T., Likens, G. E., & Bormann, F. H. (1978). The flow of energy in a forest ecosystem. *Scientific American*, 283, 92-102.
- Grant, E. H. C., Green, L. E., & Lowe, W. H. (2009). Salamander occupancy in headwater stream networks. *Freshwater Biology*, 54, 1370–1378.
- Green, J., & Passmore, M. (1999). *Field survey report: an estimate of perennial stream miles in the area of the 1997 proposed Hobet Mining Spruce No. 1 Mine*. US Environmental Protection Agency. Wheeling, WV.
- Green, J., Passmore, M., & Childers, H. (2000). *A survey of the condition of streams in the primary region of mountaintop mining/valley fill coal mining*. US Environmental Protection Agency. Wheeling, WV. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US

Environmental Protection Agency, Philadelphia, Pennsylvania.
<http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>

- Green, N. B., & Pauley, T. K. (1987). *Amphibians and reptiles in West Virginia*. Pittsburgh: University of Pittsburgh Press.
- Hairston, Jr., N. G. (1987). Diapause as a predator avoidance adaptation. In W. C. Kerfoot and A. Sih (Eds.), *Predation: Direct and indirect impacts on aquatic communities* (p. 281-290.) New England.
- Hamel, P. B. (2000). Cerulean warbler (*Dendroica cerulea*), The birds of North America online. (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/511>
- Handel, S. N. (2003). *Mountaintop removal mining/valley fill environmental impact statement technical study project report for terrestrial studies: terrestrial plant (spring herbs, woody plants) populations of forested and reclaimed sites*. Draft Report 2001. Final 2003. New Brunswick: Rutgers University. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, Pennsylvania. <http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Harper, C. A., & Guynn Jr., D. C. (1999). Factors affecting salamander density and distribution in four forest types in the southern Appalachian mountains. *Forest Ecology and Management*, 114, 245-252.
- Harpole, D. N., & Haas, C. A. (1999). Effects of seven silvicultural treatments on terrestrial salamanders. *Forest Ecology and Management*, 114, 349-356.
- Harrison, R. L. (1992). Toward a theory of inter-refuge corridor design. *Conservation Biology*, 6, 293-295.
- Hartman, K. J., Kaller, M. D., Howell, J. W., & Sweka, J. A. (2005). How much do valley fills influence headwater streams? *Hydrobiologia*, 532, 91-102.
- Hassell, K. L., Kefford, B. J., & Nuggeoda, D. 2006. Sub-lethal and chronic salinity tolerances of three freshwater insects: *Cloeon* sp. and *Centroptilum* sp. (Ephemeroptera: Baetidae) and *Chironomus* sp. (Diptera: Chironomidae). *Journal of Experimental Biology*, 209, 4024-4032.
- Hawkins, C. P. (2006a). Maintaining and restoring the ecological integrity of freshwater ecosystems: refining biological assessments. *Ecological Applications*, 16, 1249-1250.
- Hawkins, C. P. (2006b). Quantifying biological integrity by taxonomic completeness: Its utility in regional and global assessments. *Ecological Applications*, 16(4), 1277-1294.
- Hawkins, C. P., Olson J. R., & Hill R. A. (2010). The reference condition: predicting benchmarks for ecological and water-quality assessments. *Journal of the North American Benthological Society*, 29(1), 312-343.
- Hendryx, M. (2009). Mortality from heart, respiratory, and kidney disease in coal mining areas of Appalachia. *International Archives of Occupational and Environmental Health*, 82, 243-249.
- Hendryx, M., & Ahern, M. M. (2008). Relations between health indicators and residential proximity to coal mining in West Virginia. *American Journal of Public Health*, 98(4), 669-670.
- Hendryx, M., & Ahern, M. M. (2009). Mortality in Appalachian coal mining regions: The value of statistical life lost. *Public Health Reports*, 124, 541-550.
- Hendryx, M., Ahern, M. M., & Nurkiewicz, T. R. (2007). Hospitalization patterns associated with Appalachian coal mining. *Journal of Toxicology and Environmental Health, Part A*, 70, 2064-2070.

- Hendryx, M., Fedorko, E., & Anesetti-Rothermel, A. (2010). A geographical information system-based analysis of cancer mortality and population exposure to coal mining activities in West Virginia, United States of America. *Geospatial Health*, 4(2), 243-256.
- Hendryx, M., O'Donnell, K., & Horn, K. (2008). Lung cancer mortality is elevated in coal-mining areas of Appalachia. *Lung Cancer*, 62, 1-7.
- Hendryx, M., & Zullig, K. J. (2009). Higher coronary heart disease and heart attack morbidity in Appalachian coal mining regions. *Journal of Preventive Medicine*, 49(5), 355-359.
- Herkert, J. R., Szafoni, R. E., Kleen, V. M., & Schwegman, J. E. (1993). *Habitat establishment, enhancement and management for forest and grassland birds in Illinois*. Natural Heritage Technical Publication #1. Illinois Department of Conservation, Division of Natural Heritage.
<http://www.npwrc.usgs.gov/resource/birds/manbook/index.htm>
- Hinkle, C. R., McComb, W. C., & Marcus Jr., S. J. (1993.) Mixed Mesophytic Forest. pp. 203-254, 373, In W. H. Martin (Ed.). *Biodiversity of the Southeastern United States: Upland Terrestrial Communities*. New York: John Wiley & Sons, Inc.
- Hitt, N. P., & Hendryx, M. (2010). Ecological integrity of streams related to human cancer mortality rates. *Ecohealth*, 7(1), 91-104.
- Holl, K. D. (2002). Long-term vegetation recovery on reclaimed coal surface mines in the eastern USA. *Journal of Applied Ecology*, 39, 960-970.
- Hornick, L. E. (1981). Periphyton production in an Appalachian mountain trout stream. *American Midland Naturalist*, 106, 22-36.
- Howard, H. S., Berrang B., Flexner M., Pond G., & Call S. (2001). *Kentucky mountaintop mining benthic macroinvertebrate survey*. US Environmental Protection Agency. Athens, GA. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, Pennsylvania. <http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Hufford, M. (2003.) Reclaiming the Commons: Narratives of Progress, Preservation, and Ginseng. In B. J. Howell, (Ed.), *Culture, Environment, and Conservation in the Appalachian South*, Urbana: University of Illinois Press.
- Hynes, H. B. N. (1970). *The Ecology of Running Waters*. Liverpool: Liverpool University Press.
- Illinois Wildlife Habitat Commission. (1985). *The Crisis of Wildlife Habitat*. (p. 26) Illinois Department of Conservation.
- Intergovernmental Panel on Climate Change (IPCC). (2001). IPCC special report on land use, land-use change and forestry. http://www.grida.no/publications/other/ipcc_sr/?src=/climate/ipcc/land_use/index.htm
- James, F. C., McCulloch, C. E., & Wiedenfeld, D. A. (1996). New approaches to the analysis of population trends in land birds. *Ecology* 77, 13-27.
- Jeffres, C. A., Opperman, J. J., & Moyle, P. B. (2008). Ephemeral floodplain habitats provide best growth conditions for juvenile Chinook salmon in a California river. *Environmental Biology of Fishes*, 83, 449-458.
- Johnson, B. R., Fritz, K. M., Blocksom, K. A., & Walters, D. M. (2009). Larval salamanders and channel geomorphology are indicators of hydrologic permanence in forested headwater streams. *Ecological Indicators*, 9, 150-159.

- Johnson, B. R., Haas, A., & Fritz, K. M. (2010). Use of spatially explicit physicochemical data to measure downstream impacts of headwater stream disturbance. *Water Resources Research*, 46. W09526, DOI:10.1029/2009WR008417.
- Jones, K. B. (1997). *An ecological assessment of the United States mid-Atlantic Region: a landscape atlas*. U.S. EPA. EPA/600/R-97/130. Washington, D.C.
- Jorgensen, C. B. (1966). *Biology of Suspension Feeding*. Pergamon: Oxford.
- Kaplan, D.I., & Serne, R. J. (1995). *Distribution coefficient values describing iodine, neptunium, selenium, technetium, and uranium sorption to Hanford sediments*. Prepared for the U.S. Department of Energy Pacific Northwest Laboratory, Richland, Washington. DOI 10.2172/158466
- Kefford, B. E. (1998). The relationship between electrical conductivity and selected macroinvertebrate communities in four riversystems of south-west Victoria, Australia. *International Journal of Salt Lake Research*, 7, 153–170.
- Kefford, B. E. (1998). Is salinity the only water quality parameter affected when saline water is disposed in rivers? *International Journal of Salt Lake Research*, 7, 285–300.
- Kefford, B. J., Papas, P. J., & Nuggeoda, D. (2003). Relative salinity tolerance of macroinvertebrates from the Barwon River, Victoria, Australia. *Marine and Freshwater Research*, 54, 755-765.
- Kefford, B. J., Papas, P. J., Metzeling, L., & Nuggeoda, D. (2004). Do laboratory salinity tolerances of freshwater animals correspond with their field salinity? *Environmental Pollution* 129, 355–362.
- Kefford, B. J., Dalton, A., Palmer, C. G., & Nuggeoda, D. (2004). The salinity tolerance of eggs and hatchlings of selected aquatic macroinvertebrates in south-east Australia and South Africa. *Hydrobiologia*, 517, 179-192.
- Kefford, B. E., et al. (2005). What is meant by “95% of species”? An argument for the inclusion of rapid tolerance testing. *Human and Ecological Risk Assessment*, 11, 1025-1046.
- Kennedy, A. J., Cherry, D. S., & Currie, R. J. (2003). Field and laboratory assessment of a coal processing effluent in the Leading Creek watershed, Meigs County, Ohio. *Archives of Environmental Contamination and Toxicology*, 44, 324-331.
- Kennedy, A. J., Cherry, D. S., & Currie, R. J. (2004). Evaluation of ecologically relevant bioassays for a lotic system impacted by a coal-mine effluent, using *Isonychia*. *Environmental Monitoring and Assessment*, 95, 37-55.
- Kennedy, A. J., Cherry, D. S., & Zipper, C. E. (2005). Evaluation of ionic contribution to the toxicity of a coal-mine effluent using *Ceriodaphnia dubia*. *Archives of Environmental Contamination and Toxicology* 49, 155-162.
- Kiffney, P. M., & Clements, W. H. (1996). Size-dependent response of macroinvertebrates to metals in experimental streams. *Environmental Toxicology and Chemistry*, 15, 1352-1356.
- Kirk, E. (1999a). *An evaluation of the aquatic habitats provided by sediment control ponds and other aquatic enhancement structures located on mine permitted areas in southern West Virginia*. Conducted for Pen Coal Corporation, by R.E.I. Consultants, Inc. Beaver, WV. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, Pennsylvania. <http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Kirk, E. (1999b). *Benthic macroinvertebrate study of Honey Branch, its sediment control ponds, and its influence on the East Fork of Twelvepole Creek, conducted 10/08/09*. Conducted for Pen Coal Corporation, by R.E.I. Consultants, Inc. Beaver, WV.
- Knapp, S. M., Haas, C. A., Harpole, D. N., & Kirkpatrick, R. L. (2003). Initial effects of clearcutting and alternative silvicultural practices on terrestrial salamander abundance. *Conservation Biology*, 7(3), 752–762.

- Laughlin, S. B., & Kibbe, D. P. (1985). *The atlas of breeding birds of Vermont*. Hanover, NH: University Press of New England.
- Lemly, A. D. (1992). *Guidelines for evaluating selenium data from aquatic monitoring and assessment studies*. US Forest Service. Virginia Tech University, Blacksburg, VA.
- Lemly, A. D. (1993). Guidelines for evaluating selenium data from aquatic monitoring and assessment. *Environmental Monitoring and Assessment*, 28, 83–100.
- Lemly, A. D. (1999). *Selenium transport and bioaccumulation in aquatic ecosystems: a proposal for water quality criteria based on hydrological units*. US Forest Service, Virginia Tech University, Blacksburg, VA.
- Lemly, A. D. (2002a). *Selenium assessment in aquatic ecosystems: a guide for hazard evaluation and water quality criteria*. New York: Springer.
- Lemly, A. D. (2002b). Symptoms and implications of selenium toxicity in fish: the Belews Lake case example. *Aquatic Toxicology*, 57, 39-49.
- Lemly, D. M. (2009). White paper on “Aquatic hazard of selenium pollution from mountaintop removal coal mining.” Submitted for the record in Senate hearing.
- Lotrich, V. A. (1973). Growth, production, and community composition of fishes inhabiting a first-, second-, and third-order stream of eastern Kentucky. *Ecological Monographs*, 43(3), 377-397.
- MacDonald, L. & Drew, C. (2007). Influence of headwater streams on downstream reaches in forested areas. *Forest Science*, 53(2) .
- Maggard, R., & Kirk, E. (1998). *Downstream impacts of surface mining and valley fill construction. Report for Pen Coal Corporation*. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, Pennsylvania.
<http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Maier, K. J., & Knight, A. W. (1994). Ecotoxicology of selenium in freshwater ecosystems. *Reviews of Environmental Contamination & Toxicology*, 134, 31-48.
- Martin, W. H., Boyce, S. G., & Echternacht, A. C. (Eds.) (1973). *Biodiversity of the Southeastern United States: Upland Terrestrial Communities*. (pp. 1-34, 373) New York: John Wiley & Sons, Inc.
- Mattsson, B. J., & Cooper, R. J. (2006). Louisiana Waterthrushes (*Seiurus motacilla*) and habitat assessments as cost-effective indicators of instream biotic integrity. *Freshwater Biology*, 51(10), 1941-1958.
- Mattsson, B. J., & Cooper, R. J. (2009). Multiscale analysis of the effects of rainfall extremes on reproduction by an obligate riparian bird in urban and rural landscapes. *Auk*, 126(1), 64-76.
- Mattsson, B. J., Master, T. L., Mulvihill, R. S., & Robinson, W. D. (2009). Louisiana Waterthrush (*Seiurus motacilla*), In (A. Poole, (Ed.), *The birds of North America online*. Ithaca: Cornell Lab of Ornithology.
<http://bna.birds.cornell.edu/bna/species/151>
- McComb, W. C., McGarigal, K., Fraser, J. D., & Davis, W. H. (1991). Planning for basin-level cumulative effects in the Appalachian coal field. In J. E. Rodiek & E. G. Bolen (Eds.), *Wildlife and habitats in managed landscapes*. Washington, D.C.: Island Press.
- McCormick, F. H., Hughes, R. M., Kaufmann, P. R., Peck, D. V., Stoddard, J. L., & Herlihy, A. T. (2001). Development of an Index of Biotic Integrity for the Mid-Atlantic Highlands Region. *Transactions of the American Fisheries Society*. 130, 857-877.

- Meffe, G. K., & Carroll, C. R., (Eds.). (1994). *Principles of conservation biology*. Sunderland: Sinauer Associates.
- Mengel, R. M. (1965). *The birds of Kentucky*. American Ornithological Monograph 3.
- Merriam, E. R. (2009). *Mining and Residential Development Interact to Produce Highly Impaired Stream Conditions in an Intensively Mined Appalachian Watershed*. M.S. thesis. West Virginia University. Morgantown, WV.
- Merriam, E., Merovich, G. T., & Petty, J. T. In Review. *Additive effects of mining and residential development on stream conditions in an intensively mined Appalachian watershed*. M.S. thesis. West Virginia University. Morgantown, WV.
- Merricks, T. C., Cherry, D. S., Zipper, C. E., Currie, R. J., & Valenti, T. W. (2007). Coal mine hollow fill and settling pond influences on headwater streams in southern West Virginia, USA. *Environmental Monitoring and Assessment* 129, 359-378.
- Merritt, J. F. (1987). *Guide to the mammals of Pennsylvania*. Pittsburgh: University of Pittsburgh.
- Merritt, R. W., Cummins, K. W., & Burton, T. M. (1984). The role of aquatic insects in the processing and cycling of nutrients. In V.H. Resh and D.M. Rosenberg (Eds.), *The ecology of aquatic insects*, (pp. 134-163.). New York: Praeger Publishers.
- Merritt, R. W., & Cummins, D. W. (Eds.) (1996). *An introduction to the aquatic insects of North America* 3rd Edition. Dubuque: Kendall-Hunt.
- Messinger, T. (2003). *Comparison of storm response of streams in small, unmined and valley-filled watersheds, 1999–2001, Ballard Fork, West Virginia*. Water-Resources Investigations Report 02-4303, Department of the Interior, U.S. Geological Survey, Charleston, WV.
- Messinger, T., & Paybins, K. S. (2003). *Relations between precipitation and daily and monthly mean flows in gaged, unmined and valley-filled watersheds, Ballard Fork, West Virginia, 1999–2001*. Water-Resources Investigations Report 03-4113, Department of the Interior, U.S. Geological Survey, Charleston, WV.
- Meyer J. L., Strayer, D. L., Wallace, J. B., Eggert, L., Helfman, G. S., & Leonard, N. E. (2007). The contribution of headwater streams to biodiversity in river networks. *Journal of the American Water Resources Association*, 43, 86–103.
- Michel, N., Desante, D. F., Kaschube, D. R., & Nott, M. P. (2006). The Monitoring Avian Productivity and Survivorship (MAPS) Program Annual Reports, 1989-2003. NBII/MAPS Avian Demographics Query Interface. [Online.] <http://www.birdpop.org/nbii/NBIIHome.asp>
- Moler, P. E., & Franz, R., (1987). Wildlife values of small, isolated wetlands in the Southeastern coastal plain. In R. R. Odom, K. A. Riddleberger, J.C. Ozier, (Eds.), *Proceedings of the Third Nongame and Endangered Wildlife Symposium*. Georgia Department of Natural Resources, Social Circle, GA.
- Moog, O., Bauernfeind, E., & Weichselbaumer, P. (1997). Use of Ephemeroptera as saprobic indicators in Austria. In P. Landolt and M. Sartori (Eds.), *Ephemeroptera and Plecoptera: biology-ecology-systematics* (pp. 254-260). Fribourg: MTL.
- Morse, J. C., Stark, B. P., & McCafferty, W. P. (1993). Southern Appalachian streams at risk: implications for mayflies, stoneflies, caddisflies, and other aquatic biota. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 3, 293-303.
- Morse, J. C., Stark, B. P., McCafferty, W. P., & Tennessen, K. J. (1997). Southern Appalachian and other southeastern streams at risk: implications for mayflies, dragonflies, stoneflies, and caddisflies. In G.W. Benz and D. E. Collins

- (Eds). *Aquatic fauna in peril: the southeastern perspective* (pp.17-42, 554). Special Publication 1, Southeastern Aquatic Research Institute. Decatur, GA: Lenz Design and Communications.
- Mount, D. R., Gulley, D. D., Hockett, J. R., Garrison, T. D., & Evans, J. M. (1997). Statistical models to predict the toxicity of major ions to *Ceriodaphnia dubia*, *Daphnia magna*, and *Pimephales promelas* (fathead minnows). *Environmental Toxicology and Chemistry*, 16, 2009-2019.
- Mueller, A. J., Loesch, C. R., & Twedt, D. J. (1999). *Development of management objectives for breeding birds in the Mississippi Alluvial Valley*. Proceedings of Partners in Flight International Workshop. 1-5 Oct 1995, Cape May, NJ.
- Mulvihill, R. S. (1999). Effects of stream acidification on the breeding biology of an obligate riparian songbird, the Louisiana Waterthrush (*Seiurus motacilla*). In W. E. Sharpe & J. R. Drohan, (Eds.), *The effects of acidic deposition on aquatic ecosystems in Pennsylvania, Proceedings of the 1998 Pennsylvania Acidic Deposition Conference, Vol. 2* (pp. 51-61) University Park, PA: Environmental Resources Research Institute.
- Mulvihill, R. S., Newell, F. L., & Latta, S. C. (2008). Effects of acidification on the breeding ecology of a stream-dependent songbird, the Louisiana Waterthrush (*Seiurus motacilla*). *Freshwater Biology*, 53(11), 2158-2169.
- Murray, N. L., & Stauffer, D. F. (1995). Nongame bird use of habitat in central Appalachian riparian forests. *Journal of Wildlife Management*, 59, 78-88.
- Nadeau, T. L., & Rains, M. C. (2007). Hydrological connectivity between headwater streams and downstream waters: How science can inform policy. *Journal of the American Water Resource Association*, 43, 118-133.
- National Oceanic and Atmospheric Association (NOAA) Satellite and Information Services. West Virginia climate summary. <http://www.ncdc.noaa.gov/oa/climate/research/cag3/wv.html>
- National Oceanic and Atmospheric Association (NOAA) National Weather Service Climate Prediction Center. Drought monitoring. http://www.cpc.noaa.gov/products/monitoring_and_data/drought.shtml
- Negley, T. L., & Eshleman, K. N. (2006). Comparison of stormflow responses of surface-mined and forested watersheds in the Appalachian Mountains, USA. *Hydrological Processes*, 20, 3467-3483.
- Neuzil, S. G., Dulong, F. D., & Cecil, C. B. (2005). *Spatial trends in ash yield, sulfur, selenium, and other selected trace element concentrations in coal beds of the Appalachian Plateau Region, U.S.A.* Open-File Report 2005-1330 Department of the Interior, U.S. Geological Survey, Reston, VA.
- North American Bird Conservation Initiative (NABCI). (2000). Bird Conservation Regions Map. U.S. NABCI Committee, U.S. Fish and Wildlife Service, Division of Bird Habitat Conservation, Arlington, VA. <http://www.nabci-us.org/map.html>
- Nickens, T. E. (2004). Small is beautiful. *National Wildlife*, 42, 28-31.
- North Carolina Department of Environment and Natural Resources. (2005). *Identification methods for the origins of intermittent and perennial streams. Version 3.1.* Division of Water Quality. Raleigh, NC. http://h2o.enr.state.nc.us/ncwetlands/documents/NC_Stream_ID_Manual.pdf
- Nowacki, G. J., & Abrams, M. D. (1991). Community and edaphic analysis of mixed oak forests in the ridge and valley province of central Pennsylvania. In L.H. McCormick and K.W. Gottschalk (Eds.), *8th Central Hardwood Forest Conference: Proceedings*, (pp. 247-260). Pennsylvania State University.
- O'Connell, T. J., Brooks, R. P., Laubscher, S. E., Mulvihill, R. S., & Master, T. L. (2003). *Using bioindicators to develop a calibrated index of regional ecological integrity for forested headwater ecosystems*. Final Report to U.S.

Environmental Protection Agency, STAR Grants Program. Penn State Cooperative Wetlands Center, Pennsylvania State University, University Park, PA.

O'Connell, T. J., Jackson, L. E., & Brooks, R. P. (1998). A bird community index of biotic integrity for the Mid-Atlantic highlands. *Environmental Monitoring and Assessment*, 51, 145–156.

Ohio Environmental Protection Agency. (2002). *Technical report: Ohio's primary headwater streams-macroinvertebrate assemblages*. Division of Surface Water, Columbus, OH.
http://www.epa.ohio.gov/portals/35/wqs/headwaters/TechRep_Macroinvert_2002.pdf

Ohio Environmental Protection Agency. (2009). Field evaluation manual for Ohio's primary headwater habitat streams, Version 2.3. Division of Surface Water, Columbus, OH.
http://www.epa.ohio.gov/portals/35/wqs/headwaters/PHWHManual_2009.pdf

Ohlendorf, H. A., Hoffman, D. J., Rattner, B. A., Burton Jr., G. A., & Cairns Jr., J. (2003). Ecotoxicology of selenium. In *Handbook of Ecotoxicology, Second Edition*, (pp. 465-500). Boca Ration: Lewis.

Orr, P. L., Guiguer, K. R., & Russel, C. K. (2005). Food chain transfer of selenium in lentic and lotic habitats of a western Canadian watershed. *Ecotoxicology and Environmental Safety*, 63, 175-188.

Orwig, D. A., Cobb, R. C., D'Amato, A. W., Kizlinski, M. L., and Foster, D. R. (2008). Multi-year ecosystem response to hemlock woolly adelgid infestation in southern New England forests. *Canadian Journal of Forest Research-Revue Canadienne De Recherche Forestiere*, 38(4), 834-843.

Palmer, M. A., & Bernhardt, E. S. (2009). White paper on “Mountaintop Mining Valley Fills and Aquatic Ecosystems: A Scientific Primer on Impacts and Mitigation Approaches” Submitted for the record in Senate hearing.
[www.http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=66fea6d0-9bce-4a9b-be47-aa264a471a89](http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=66fea6d0-9bce-4a9b-be47-aa264a471a89)

Palmer, M. A., et al. (2010). Mountaintop mining consequences. *Science*, 327, 149-149.

Parker, C. R., Flint, O. S., Jacobus, L. M., Kondratieff, B. C., McCafferty, W. P., & Morse, J. C. (2007). Ephemeroptera, Plecoptera, Megaloptera, and Trichoptera of Great Smoky Mountains National Park. *Southeastern Naturalist Special Issue 1*, 159-174.

Pate, R. L. (2008). *Soil Survey of Logan and Mingo Counties, West Virginia*. USDA, Natural Resources Conservation Service. 317 pp.

Patnode, K., Kain, C., Ramsey, D., Rhodes, J., & Evans, B. (2005). *Salamander assemblage survey of mercury and selenium contaminated headwater sites in the Appalachian Mountains of Pennsylvania, Virginia, and West Virginia*. USFWS Region 5 Environmental Contaminants Program Final Report. 21 pp.

Patrick, R. (1948). Factors effecting the distribution of diatoms. *Botanical Review*, 14, 473-524.

Patton, P. W. C. (1994). The effect of edge on avian nest success: how strong is the evidence? *Conservation Biology*, 8, 17-26.

Paybins, K. S. (2003). *Flow origin, drainage area, and hydrologic characteristics for headwater streams in the mountaintop coal-mining region of southern West Virginia*. Water Resources Investigation Report 02-4300. U.S. Geological Survey. Charleston, WV.

Paybins, K. S., Messinger, T., Eychaner, J. H., Chambers, D. B., & Kozar, M. D. (2000). *Water quality in the Kanawha-New River Basin. West Virginia, Virginia, and North Carolina, 1996-98*: U.S. Geological Survey Circular 1204. 32 pp. <http://pubs.water.usgs.gov/circ1204/>

- Peterjohn, B. G., Sauer, J. R., & Robbins, C. S. (1995). Population trends from the North American breeding bird survey. In T. E. Martin & D. M. Finch, (Eds.), *Ecology and Management of Neotropical Migratory Birds* (pp 3-39). New York: Oxford University Press.
- Peterman, W. E., Crawford, J. A., & Semlitsch, R. D. (2008). Productivity and significance of headwater streams: population structure and biomass of the black-bellied salamander (*Desmognathus quadramaculatus*). *Freshwater Biology* 53, 347–357.
- Petranka, J. W. (1998). *Salamanders of the United States and Canada*. Washington, D.C.: Smithsonian Institution Press.
- Petranka, J. W., Eldridge, M. E., & Haley, K. E. (1993). Effects of timber harvesting on southern Appalachian salamanders. *Conservation Biology*, 7(2), 363-370.
- Petty, J. T., Fulton, J. B., Strager, M. P., Merovich, Jr., G. T., Stiles, J. M., & Ziemkiewicz, P. F. (2010). Landscape indicators and thresholds of stream ecological impairment in an intensively mined Appalachian watershed. *Journal of the North American Benthological Society*, 29(4), 1292–1309.
- Phillips, J. D. (2004). Impacts of surface mine valley fills on headwater floods in eastern Kentucky. *Environmental Geology*, 45, 367-380.
- Pond, G. J. (2004). *Effects of surface mining and residential land use on headwater stream biotic integrity in the eastern Kentucky coalfield region*. Kentucky Department for Environmental Protection, Division of Water, Frankfort, KY.
- Pond, G. J. (2010). Patterns of Ephemeroptera taxa loss in Appalachian headwater streams (Kentucky, USA). *Hydrobiologia* DOI 10.1007/s10750-009-0081-6.
- Pond, G. J., & Passmore, M. (2008). *Issue Paper: Recommendations for determining Relatively Permanent Waters (RPWs) in headwater streams in the Huntington and Pittsburgh Corps Districts*. July 19, 2007; Finalized May 19, 2008. US Environmental Protection Agency. Wheeling, WV.
- Pond, G. J., Passmore, M. E., Borsuk, F. A., Reynolds, L. & Rose, C. J. (2008). Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools. *Journal of the North American Benthological Society*, 27 (3), 717-737.
- Pond, G. J., & McMurray, S. E. (2002). *A macroinvertebrate bioassessment index for headwater streams in the eastern coalfield region, Kentucky*. Kentucky Department for Environmental Protection, Division of Water, Frankfort, KY.
- Pough, F. H., Smith, E. M., Rhodes, D. H. & Collazo, A. (1987). The abundance of salamanders in forest stands with different histories of disturbance. *Forest Ecology and Management*, 20, 1-9.
- Robbins, C. S. (1979). Effect of forest fragmentation on bird populations. In R. M. DeGraaf and K. E. Evans, (Comps.) *Management of North Central and Northeastern Forests for Nongame Birds. General Technical Report Nc-51* (pp. 198-212). USDA, Forest Service, North Central Forest Experiment Station, St. Paul, MN.
- Robbins, C. S., Sauer, J. R., Greenburg, R. S., & Droege, S. (1989). Population declines in North American birds that migrate to the neotropics. *Proceedings of the National Academy of Sciences*, 86, 7658-7662.
- Robbins, C. S. (1980). Effect of forest fragmentation on breeding bird populations in the piedmont of the Mid-Atlantic Region. *Atlantic Naturalist*, 33, 31-36.
- Robbins, C. S., Fitzpatrick, J. W. & Hamel, P. B. (1992). A warbler in trouble: *Dendroica cerulea*. In J. M. Hagan III, & D. W. Johnston (Eds.), *Ecology and conservation of neotropical migrant landbirds*. (pp. 549-562). Washington, D.C.: Smithsonian Institution Press.

- Robinson, W. D. (1990). *Louisiana Waterthrush foraging behavior and microhabitat selection in southern Illinois*. Master's Thesis, Southern Illinois University, Carbondale, IL.
- Rocco, G. L., Brooks, R. P., & Hite, J. T. (2004). *Stream Plethodontid Assemblage Response (SPAR) index: development, application, and verification in the MAHA*. Penn State Cooperative Wetlands Center, Pennsylvania State University Report No. 2004-1 prepared for US EPA Star Grant Program.
- Rodgers, J. H., Johnson, B. M., & Bishop, W. M. (In Press.) Comparison of three algaecides for controlling the density of *Prymnesium parvum*. *Journal of the American Water Resources Association* Golden Algae Featured Collection.
- Rosenberg, K. V., & Wells, J. V. (2002). Global perspectives on neotropical migratory bird conservation in the northeast: Long-term responsibility vs. immediate concern. http://birds.cornell.edu/pifcapemay/rosenberg_wells.htm.
- Ross, R. M., Redell, L. A., Bennett, R. M., & Young, J. A. (2004). Mesohabitat use of threatened hemlock forests by breeding birds of the Delaware River Basin in northeastern United States. *Natural Areas Journal*, 24(4), 307-315.
- Sager, D. R., et al. (2008). Toxic *Prymnesium parvum*: A potential threat to U.S. reservoirs. *American Fisheries Society Symposium*, 62, 261-273.
- Samuel, D. E., & Whitmore R. C. (1979). Reclamation and management of surface mines for game and non-game birds. pp. 578-582 in J. Luchok, J. D. Cawthon and M. J. Breslin (Eds.). *Hill Lands: proceedings of an international symposium held in Morgantown WV, 3-9 October 1976*. West Virginia University, Morgantown, WV.
- Sauer, J. R. (1993). Monitoring goals and programs of the U.S. Fish and Wildlife Service. In D.M. Finch & P. W. Stangel (Eds.), *Status and management of neotropical migratory birds; 21-25 Sep 1992*(pp. 245-251). Estes Park, CO, U.S. Department of Agriculture, Forest Service General Technical Report RM-229, Fort Collins, CO.
- Sauer, J. R., Hines, J. E., & Fallon, J. (2004). *The North American Breeding Bird Survey, Results and Analysis 1966-2003*. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD. [Online.] <http://www.mbr-pwrc.usgs.gov/bbs/>
- Sauer, J. R., Hines, J.E., & Fallon, J. (2005). *The North American breeding bird survey, results and analysis 1966 - 2005*. Version 6.2.2006. USGS Patuxent Wildlife Research Center, Laurel, MD.
- Science Applications International Corporation. (1998). *Analysis of valley fill impacts using benthic macroinvertebrates*. Draft final report to U.S. EPA, 30 Sept. 1998.
- Silva, P. S., & Giles, C. (2010). Memorandum: Detailed Guidance: Improving EPA Review of Appalachian Surface Coal Mining Operations under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order. USEPA, Washington D.C.
- Simmons, J. A., et al. (2008.) Forest to reclaimed mine land use change leads to altered ecosystem structure and function. *Ecological Applications*, 18, 104-118.
- Skorupa, J. P. (1998). Selenium poisoning of fish and wildlife in nature: Lessons from twelve real-world examples. In W. T. Frankenberger, & R. A. Engberg (Eds), *Environmental chemistry of selenium* (pp. 315–354). New York: Marcel Dekker.
- Skousen, J., Ziemkiewicz, P., & Venable, C. (2006). Tree recruitment and growth on 20-year-old, unreclaimed surface mined lands in West Virginia. *International Journal of Mining, Reclamation and Environment*, 20, 142–154.
- Smith, W.P., Hamel, P.B., & Ford, R.P. (1996). Mississippi Alluvial Valley forest conversion: implications for eastern North American avifauna. *Proceedings of the Annual Conference Southeastern Association Fish and Wildlife Agencies*, 47, 460-469.

- Snyder, C. D., Young, J. A., Lemarie, D. P., & Smith, D. R. (2002.) Influence of eastern hemlock (*Tsuga canadensis*) forests on aquatic invertebrate assemblages in headwater streams. *Canadian Journal of Fisheries and Aquatic Sciences*, 59(2), 262-275.
- Soucek, D. J., & Kennedy, A. J. (2005). Effects of hardness, chloride, and acclimation on the acute toxicity of sulfate to freshwater invertebrates. *Environmental Toxicology and Chemistry*, 24, 1204-1210.
- Soucek, D.J. (2007a). Bioenergetic effects of sodium sulfate on the freshwater crustacean, *Ceriodaphnia dubia*. *Ecotoxicology*, 16(3), 317-325.
- Soucek, D. J. (2007b). Comparison of hardness- and chloride-regulated acute effects of sodium sulfate on two freshwater crustaceans. *Environmental Toxicology and Chemistry*, 26, 773-779.
- Soule, M. E. (1991). Conservation: tactics for a constant crisis. *Science*, 253, 744-750.
- Strager, M. P., Petty, J. T., Strager, J. M., & Fulton, J. B. (2009). A spatially explicit framework for quantifying downstream hydrologic conditions. *Journal of Environmental Management*, 90, 1854-1861.
- Stauffer, J., & Ferreri, C. P. (2002). *Characterization of stream fish assemblages in selected regions of mountain top removal/valley fill coal mining*. Pennsylvania State University, State College, PA. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, Pennsylvania. <http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Stein, B. A., Kutner, L., & Adams, J. (Eds.). (2000). *Precious Heritage, The status of biodiversity in the United States*. Oxford: Oxford University Press.
- Stephenson, S. L., Ash, A. N., & Stauffer, D. F. (1993). Appalachian oak forests. In W. H. Martin, S. G. Boyce and A. C. Echternacht (Eds.), *Biodiversity of the Southeastern United States: Upland terrestrial communities* (pp. 255-304). New York: John Wiley & Sons Inc.
- Stout, B., & Wallace, J. B. (2003). *A survey of eight major aquatic insect orders associated with small headwater streams subject to valley fills from mountaintop mining*. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, PA. <http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Strausbaugh, P. D., & Core, E. L. (1978). *Flora of West Virginia*. 2nd Edition.
- Stein, B. A., Kutner, L. S., & Adams, J. S. (2000). *Precious Heritage: The Status of Biodiversity in the United States*. Oxford University Press.
- Stucker, H. S. (2000). *Biodiversity of Southeastern Minnesota forested streams: relationships between trout habitat improvement practices, riparian communities and Louisiana Waterthrushes*. Master's Thesis, University of Minnesota, St. Paul, MN.
- Sudduth, E.B., Meyer, J. L., & Bernhardt, E. S. (2007). Stream restoration practices in the Southeastern United States. *Restoration Ecology*, 15(3), 572-583.
- Svec, J. R., Kolka, R. K., & Stringer, J. W. (2005). Defining perennial, intermittent, and ephemeral channels in eastern Kentucky: Application to forestry best management practices. *Forest Ecology and Management*, 214, 170-182.
- Swift, M. C. (2002). Stream ecosystem response to and recovery from, experimental exposure to selenium. *Journal of Aquatic Ecosystem Stress and Recovery*, 9, 159-184.
- U.S. Army Corps of Engineers Huntington District. (2006). Spruce No. 1 Draft Environmental Impact Statement, March 2006. Huntington, WV.

- U.S. Army Corps of Engineers Huntington District. (2006). Spruce No. 1 Mine Final Environmental Impact Statement, September 2006. Huntington, WV.
- U.S. Census Bureau; Census 2000; generated 22 December 2009 by Matthew T. Lee using American FactFinder; <http://factfinder.census.gov>
- U. S. Department of Agriculture (USDA). (1998). *Stream Visual Assessment Protocol*. National Water and Climate Center Technical Note 99–1. Natural Resources Conservation Service (NRCS) Aquatic Assessment Workgroup.
- U.S. Environmental Protection Agency (U.S. EPA). (1998). *Guidelines for ecological risk assessment*. EPA/630/R-95/002F. Washington, D.C.
- U.S. EPA. (2000). *Stressor identification guidance document*. EPA/822B-00/025. Washington, D.C.
- U.S. EPA. (2004). *Draft aquatic life water quality criteria for selenium 2004*. EPA-822-D-04-001. Washington, D.C.
- U.S. EPA. (2005a). Interagency mountaintop mining/valley fills in Appalachia Programmatic Environmental Impact Statement (PEIS) finalized in October 2005. www.epa.gov/Region3/mtntop/eis2005.htm.
- U.S. EPA. (2005b). *Partition coefficients for metals in surface water, soil, and waste*. EPA/600/R-05/074. Washington, D.C.
- U.S. EPA. (2009). *The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields*. Office of Research and Development, National Center for Environmental Assessment, Washington, D.C. EPA/600/R-09/138A.
- U.S. EPA Region 3 Toxicity Testing Database. Accessed January 2010. Wheeling, WV.
- U.S. EPA. (2010a). *A Field-based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams*. EPA/600/R-10/023A. Office of Research and Development, National Center for Environmental Assessment, Washington, D.C.
- U.S. EPA. (2010b). *Inferring causes of biological impairment in the Clear Fork Watershed, West Virginia*. EPA/600/R-08/146. Washington, D.C.
- U.S. EPA. Notes taken by Scott Fulton at an April 2010 U.S. EPA meeting with Arch Coal.
- U.S. Fish and Wildlife Service (U.S. FWS). (1978). *Preliminary assessment of the fish and wildlife resources of the Tug Fork River sub-basin*. Elkins, WV.
- U.S. FWS. (1998a). *Permitted stream losses due to valley filling in Kentucky, Pennsylvania, Virginia, and West Virginia: a partial inventory. Kentucky/Tennessee, Pennsylvania, Southwestern Virginia, and West Virginia*. USFWS Ecological Services Field Offices. Sept. 1998.
- U.S. FWS. (1998b). *A survey of aquatic life and terrestrial wildlife habitats on the proposed Spruce No. 1 Surface Mine in Logan County, West Virginia*. Pennsylvania Field Office, State College, PA. 23 pp.
- U.S. FWS. (2000). *The value of headwater streams: results of a workshop*. State College, PA. April 13, 1999. Sponsored by the Pennsylvania Field Office. April 2000.
- U.S. FWS. (2002). Louisiana Waterthrush habitat model. http://www.fws.gov/r5gomp/gom/habitatstudy/metadata2/Louisiana_waterthrush_model.htm.
- U.S. FWS. (2007a). *A conservation action plan for the Cerulean Warbler (*Dendroica cerulea*)*. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Focal Species Program. Revised version – 30 June 2007. 14 pp.

- U.S. FWS. (2007b). *Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision*. Fort Snelling, MN. 258 pp.
- U.S. FWS. (2008). *Birds of Conservation Concern 2008*. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, VA. 85 pp. <http://www.fws.gov/migratorybirds/>
- Van Kirk, R.W., & Hill, S. L. (2006). *Modeling predicts trout population response to selenium based on individual-level toxicity*. Idaho State University, Final Project Report to Greater Yellowstone Coalition. Idaho Falls, ID.
- Vannote, R. L., Minshall, G. W., Cummins, K.W., Sedell, J. R., & Cushing, C. E. (1980). The river continuum concept. *Canadian Journal of Fisheries and Aquatic Sciences*, 37, 130-137.
- Van Sickle, J., Hawkins, C. P., Larsen, D. P., & Herlihy, A. T. (2005). A null model for the expected macroinvertebrate assemblage in streams. *Journal of the North American Benthological Society*, 24(1), 178-191.
- Van Sickle, J., Larsen, D. P., & Hawkins, C. P. (2007). Exclusion of rare taxa affects performance of the O/E index in bioassessments. *Journal of the North American Benthological Society*, 26(2), 319-331.
- Vesper, D., Bryant, G., & Ziemkiewicz, P. F. (2004). *A preliminary study on the speciation of selenium in a West Virginia watershed*. Paper presented at the 2004 National Meeting of the American Society of Mining and Reclamation and the 25th West Virginia Surface Mine Drainage Task Force, April 18-24, 2004, Morgantown, WV. Published by ASMR, p.1950-1959.
- Vesper, D., Roy, M., & Rhoads, C. L. (2008). Selenium distribution and mode of occurrence in the Kanawha Formation, southern West Virginia, U.S.A. *International Journal of Coal Geology*, 73, 237-249.
- Villard, M. A., & Maurer, B. A. (1996). Geostatistics as a tool for examining hypothesized declines in migratory songbirds. *Ecology*, 77, 59-68.
- Von Schiller, D., Martí, E., Riera, J. L., Ribot, M., Argerich, A., Fonollà P., & Sabater, F. (2008). Inter-annual, annual, and seasonal variation of P and N retention in a perennial and an intermittent stream. *Ecosystems*, 11, 670-687.
- Wallace, J. B., Webster, J. R., & Lowe, R. L. (1992). High-gradient streams of the Appalachians. In Hackney, C.T., S. M. Adams & W. H. Martin (Eds.), *Biodiversity of the Southeastern United States: Aquatic Communities*. New York: John Wiley & Sons, Inc.
- Wallace, J. B., & Gurtz, M. E. (1986). Response of *Baetis* mayflies (Ephemeroptera) to catchment logging. *American Midland Naturalist*, 115, 25-41.
- Wallace, J. B., & Merritt, R. W. (1980). Filter-feeding ecology of aquatic insects. *Annual Review of Entomology*, 25, 103-132.
- Walters, D. M. (2006). *Development of a Fish Index of Biotic Integrity to assess the condition of West Virginia streams: Technical Support Document*. EPA/600/R-06/010. U.S. Environmental Protection Agency, Cincinnati, OH.
- Warner, R. E. (1979). *Fish and wildlife resource needs in riparian ecosystems*. Proceedings of a Workshop. May 30-31, 1979: 53. USFWS, EELUT, Kearneysville, WV.
- Wayland, M., & Crosley, R. (2006). Selenium and other trace elements in aquatic insects in coal mine-affected streams in the Rocky Mountains of Alberta, Canada. *Archives of Environmental Contamination and Toxicology*, 50, 511-522.
- Weakland, C. A., & Wood, P. B. (2005). Cerulean warbler (*Dendroica cerulea*) microhabitat and landscape-level habitat characteristics in southern West Virginia. *The Auk* 122, 497-508.

- Webster, J. R. (1983). Stability of stream ecosystems. In J.R. Barnes & G.W. Minshall (Eds.), *Stream Ecology* (pp. 355-395). New York: Plenum.
- Webster, J. R. (1990). Effects of forest disturbance on particulate organic matter budgets of small streams. *Journal of the North American Benthological Society*, 9, 120-140.
- Webster, J. R., Wallace, J. B., & Benfield, E. F. (1995). Organic processes in streams of the Eastern United States. In C.E. Cushing, G.W. Minshall, & K.W. Cummins (Eds.), *River and Stream Ecosystems (Ecosystems of the World)*. Amsterdam: Elsevier Science.
- Wells, J. V. (2007). *Birder's Conservation Handbook: 100 North American Birds at Risk*. Princeton: Princeton University Press,. 464 pp.
- West Virginia Breeding Bird Atlas, 1984-1989.
http://137.227.245.162/bba/index.cfm?fa=explore.ResultsSummary&BBA_ID=WV1984
- West Virginia Department Environmental Protection (WVDEP) 303(d) lists.
http://www.dep.wv.gov/WWE/watershed/IR/Pages/303d_305b.aspx
- WVDEP. (1997). *An ecological assessment of the Coal River Watershed*. Report number - 05050009 – 1997. Watershed Assessment Program, Division of Water Resources, West Virginia Department of Environmental Protection, Charleston WV.
- WVDEP. (1997). *An ecological assessment of the Elk River Watershed*. Charleston, WV.
- WVDEP. (1997). *An ecological assessment of the Upper Kanawha River Watershed*. Charleston, WV.
- WVDEP. (2006). *Maximum Daily Loads for selected streams in the Coal River Watershed, West Virginia, Final Approved Report, and Appendices*. Watershed Assessment Program, Division of Water Resources, West Virginia Department of Environmental Protection, Charleston WV.
- WVDEP. (2007). *Tug Fork Watershed: a summary of the Watershed Assessment Section's 1998 and 2003 Monitoring Efforts*. Charleston, WV.
- WVDEP. (2007). *West Virginia integrated water quality monitoring and assessment report 2006*. Charleston, WV.
- WVDEP. (2008). *West Virginia integrated water quality monitoring and assessment report 2008*. Charleston, WV.
- WVDEP. (2009). *Selenium bioaccumulation among select stream and lake fishes in West Virginia*. Watershed Assessment Program, Division of Water Resources. Charleston WV.
- WVDEP, Division of Mining and Reclamation. (2009). Mining permit boundaries. Data retrieved December 28, 2009, from <http://gis.wvdep.org/data/omr.html>.
- WVDEP. (2010). *Selenium-induced developmental deformities among fishes in West Virginia*. Watershed Assessment Program, Division of Water Resources, West Virginia Department of Environmental Protection, Charleston WV.
<http://www.dep.wv.gov/WWE/watershed/wqmonitoring/Documents/Selenium/Se%20Larvae%202010%20final.pdf>
- WVDEP. Technical Applications and Geographic Information Systems (TAGIS). WVDEP Equis Trend Station Explorer. <http://gisonline.dep.wv.gov/equis/equis.html>
- WVDEP. Division of Water and Wastewater Management. Ambient sampling data. Accessed December 2009.
- WVDEP Basic guidelines for biological thresholds to certain water quality constituents used by WVDEP's TMDL program in stressor identification. Charleston, WV.

- WVDEP Office of Hydrologic Protection Unit (OMR), Division of Mining and Reclamation, Discharge Monitoring Reports from WV1017021, 9/30/2009 and 08/31/2009. Charleston, WV.
- WVDEP (2009). Watershed assessment program database. Accessed December 2009. Charleston, WV.
- WVDEP, unpublished data. (2010). Preliminary report from Dr. David Hambright to WVDEP.
- West Virginia Department of Natural Resources (WVDR). (1976). *Basin water quality management plan for the Big Sandy-Tug Fork River Basin*. Charleston, WV.
- WVDR, Division of Wildlife Resources. (1977). *Today's Plan for Tomorrow's Wildlife: A Strategic Plan for Fish, Game, and Non-Game Management, 1975-1985*. Charleston, WV.
- WVDR Fish Database. (2009). Accessed December 2009. Elkins, WV.
- WVDNR, Division of Natural Resources, Wildlife Resources Section. (2009). *Federal Assistance Performance Report: Endangered Species (Animals), Project E-1, Segment 26 (1 October 2008 – 30 September 2009)*. 47 pp. + Appendices.
- West Virginia Geological and Economic Survey (WVGES). (2002) Trace Elements in West Virginia Coals. (Last revised: March 2, 2002.) <http://www.wvgs.wvnet.edu/www/datastat/te/SeHome.htm>
- West Virginia Natural Heritage Program. (2007). *Rare, Threatened and Endangered Animals*. 14 pp. <http://www.wvdnr.gov/Wildlife/documents/Animals2007.pdf>
- Whittaker, R. H. (1956). Vegetation of the Great Smoky Mountains. *Ecological Monograph*, 22, 1-44.
- Whittaker, R. H. (1975). *Communities and Ecosystems 2nd Edition*. New York: Macmillan.
- Wickham, J. D., Riitters, K. H., Wade, T. G., Coan, M., & Homer, C. (2007). The effect of Appalachian mountaintop mining on interior forest. *Landscape Ecology*, 22, 179-187.
- Wiley, J. B., & Brogan, F. D. (2003). *Comparison of peak discharges among sites with and without valley fills for the July 8–9, 2001, flood in the headwaters of Clear Fork, Coal River basin, mountaintop coal-mining region, southern West Virginia*. Open-File Report 03-133, Department of the Interior, U.S. Geological Survey, Charleston, WV. <http://pubs.usgs.gov/of/2003/ofr03-133/pdf/ofr03133.pdf>
- Wiley, J. B., Evaldi, R. D., Eychaner, J. H., & Chambers, D. B. (2001). *Reconnaissance of stream geomorphology, low streamflow, and stream temperature in the mountaintop coal-mining region, southern West Virginia, 1999-2000*. U.S. Department of the Interior, U.S. Geological Survey, Charleston, WV. Water-Resources Investigations Report 01-4092. http://pubs.usgs.gov/wri/wri014092/pdf/wri01-4092.book_new.pdf.
- Williams, J. M. (2003). *Impacts on terrestrial and streamside herpetofauna by mountaintop removal mining in southern West Virginia*. Ph. D. Dissertation, West Virginia University, Morgantown, WV.
- Williams, J. M., & Wood, P. B. (2004). *Streamside salamanders in valley fill and reference streams in southern West Virginia*. Paper presented at the 2004 National Meeting of the American Society of Mining and Reclamation and The 25th West Virginia Surface Mine Drainage Task Force, April 18-24, 2004. ASMR: Lexington, KY.
- Wilson, D. E., & Ruff, S. (1999). *The Smithsonian book of North American mammals*. Washington D.C.: Smithsonian Institution Press.
- Wilson, H. L. (1951). *Cover mapping and habitat analysis*. Unpublished final report, Federal Aid in Wildlife Restoration Project 21-R. Conservation Commission of West Virginia: 221 & 116 of supplement.

- Winter, T. C. (2007). The role of groundwater in generating streamflow in headwater areas and in maintaining base flow. *Journal of the American Water Resources Association*, 43, 15–25.
- Wipfli, M. S., Richardson, J. S., & Naiman, R. J. (2007). Ecological linkages between headwaters and downstream ecosystems: transport of organic matter, invertebrates, and wood down headwater channels. *Journal of the American Water Resources Association*, 43, 72–85.
- Wollheim, W. M., et al. (2008). Global N removal by freshwater aquatic systems: a spatially distributed, within-basin approach. *Global Biogeochemical Cycles*, 22, GB2026.
- Wood, P. B., & Edwards, J. W. (2002). *Mountaintop removal mining/valley fill Environmental Impact Statement technical study project report for terrestrial studies: terrestrial vertebrate (breeding songbird, raptor, small mammal, herpetofaunal) populations of forested and reclaimed sites*. Draft Report 2001. Final 2002. West Virginia University, Morgantown WV. Appendix in Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. US Environmental Protection Agency, Philadelphia, Pennsylvania.
<http://www.epa.gov/region03/mtntop/eis2003appendices.htm#appd>
- Wood, P. B., Bosworth, S. B., & Dettmers, R. (2006). Cerulean warbler abundance and occurrence relative to large-scale edge and habitat characteristics. *Condor*, 108, 154-165.
- Woods, A. J., Omernik, J. M., Brown, D. D. , & Kiilsgaard, C. W. (1996). *Level III and IV ecoregions of Pennsylvania and the Blue Ridge Mountains, the Ridge and Valley, and Central Appalachians of Virginia, West Virginia, and Maryland*. EPA/600/R-96/077. National Health and Environmental Effects Research Laboratory, US Environmental Protection Agency, Corvallis, OR.
- Wunderle Jr., J. M., & Waide, R. B. (1994). Future prospects for nearctic migrants wintering in Caribbean forests. *Bird Conservation International*, 4, 191-207.
- Wunsch, D. R., Dinger, J. S., Taylor, P. B., Carey, D. I., & Graham C. D. R. (1996). Hydrogeology, hydrogeochemistry, and spoil settlement at a large mine-spoil area in eastern Kentucky: Star Fire Tract. Kentucky Geological Survey, University of Kentucky, Lexington, KY.
- Wunsch, D. R., Dinger, J. S., & Graham, C. D. R. (1999). Predicting ground-water movement in large mine spoil areas in the Appalachian Plateau. *International Journal of Coal Geology*, 41, 73-106.
- Yahner, R. H. (1988). Changes in wildlife communities near edges. *Conservation Biology*, 2, 333-339.
- Yuill, C. (2001). Land use assessment: mountaintop mining and the Mountaintop Mining Region of West Virginia. Draft Report. West Virginia University.
- Ziegler, C. G., Suter II, G. W., Kefford, B. J., Schofield, K. A., & Pond, G. J. (2007). Common candidate cause: ionic strength. In U.S. EPA Causal Analysis and Diagnosis Decision Information System.
http://cfpub.epa.gov/caddis/candidate.cfm?section=138&step=24&parent_section=132
- Ziemkiewicz, P. (2009). *Identifying Sources and Effects of Selenium in the Mud River Basin*. West Virginia Water Research Institute Progress Report to Patriot Coal, November 30, 2009.

Gregory Peck/DC/USEPA/US

12/15/2010 05:00 PM

To Denise Keehner, Ephraim King, Jim Hanlon, Adam Kushner

cc Nancy Stoner, Benita Best-Wong, Randy Hill, Jeff Lape, Tanya Code, Louis Eby, Lynn Zipf, Joe Beaman, Betsy Behl, David Evans, Brian Frazer, Deborah Nagle, Marcus Zobrist, Tom Lavery, Grace Robiou, Maryt Smith, Matthew Klasen, Mark Pollins, Steven Neugeboren

bcc

Subject Draft agenda for long-term MTM meeting Monday 12/20, 4-5 pm

Hi everyone,

Nancy has scheduled a follow-up meeting on long-term MTM options for next Monday, December 20 from 4-5 pm. In prep for that meeting, we wanted to send out a straw agenda to get feedback and aid in your preparation for the meeting.

As you may remember, we had an initial meeting on this topic on October 29. As framed in the proposed draft agenda, we're suggesting a focus on updates to the topics discussed on the 29th, more detail on the topics not covered on the 29th, and a brief discussion of next steps in the context of revising the April 1 guidance by April 1, 2011.

Please review the attached draft agenda and let Matt and me know your thoughts. We'll turn this into a final version later this week in preparation for Monday's meeting. We recognize that Mark, Adam, and Cynthia are invited from OECA this time around, so we would particularly welcome a way to add enforcement topics to this agenda as well.

I've also attached the issue paper we pulled together for the last meeting. Please update this document as appropriate with progress on these efforts (if appropriate) since our prior meeting.

Thanks,
Greg



Dec 20 Draft Agenda -- Long Term MTM Options.docx



Preliminary Policy Options for Addressing Surface Coal Mining (Draft 10-28-10).doc

ATTACHMENTS REDACTED - DELIBERATIVE

Gregory E. Peck
Chief of Staff
Office of Water
U.S. Environmental Protection Agency

Brian Frazer/DC/USEPA/US

12/15/2010 05:02 PM

To "Brian Topping"

cc

bcc

Subject Fw: Draft agenda for long-term MTM meeting Monday 12/20, 4-5 pm

Brian Frazer
Chief, Wetlands & Aquatic Resources Regulatory Branch
O:202-566-1652
C:202-379-6906

Sent from my BlackBerry Wireless Handheld
Gregory Peck

----- Original Message -----

From: Gregory Peck

Sent: 12/15/2010 05:00 PM EST

To: Denise Keehner; Ephraim King; Jim Hanlon; Adam Kushner

Cc: Nancy Stoner; Benita Best-Wong; Randy Hill; Jeff Lape; Tanya Code; Louis Eby; Lynn Zipf; Joe Beaman; Betsy Behl; David Evans; Brian Frazer; Deborah Nagle; Marcus Zobrist; Tom Laverty; Grace Robiou; Maryt Smith; Matthew Klasen; Mark Pollins; Steven Neugeboren

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Greg



ATTACHMENT REDACTED - DELIBERATIVE

Dec 20 Draft Agenda -- Long Term MTM Options.docx



ATTACHMENT REDACTED - DELIBERATIVE

Preliminary Policy Options for Addressing Surface Coal Mining (Draft 10-28-10).doc

Gregory E. Peck
Chief of Staff
Office of Water
U.S. Environmental Protection Agency

Tom Lavery/DC/USEPA/US
12/15/2010 05:12 PM

To Sarita Hoyt, Michelle Schutz, David Hair, Js Wilson, Sharmin Syed, Colleen Forestieri
cc Martha Segall, Marcus Zobrist
bcc
Subject Fw: Draft agenda for long-term MTM meeting Monday 12/20, 4-5 pm

Folks,

Here are materials for Monday's long-term MTM strategy meeting.

(b) (5)

Need ot see who has the lead for OWM and who needs to go in support

thanks

Tom

----- Forwarded by Tom Lavery/DC/USEPA/US on 12/15/2010 05:10 PM -----

From: Gregory Peck/DC/USEPA/US
To: Denise Keehner/DC/USEPA/US@EPA, Ephraim King/DC/USEPA/US@EPA, Jim Hanlon/DC/USEPA/US@EPA, Adam Kushner/DC/USEPA/US@EPA
Cc: Nancy Stoner/DC/USEPA/US@EPA, Benita Best-Wong/DC/USEPA/US@EPA, Randy Hill/DC/USEPA/US@EPA, Jeff Lape/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EPA, Louis Eby/DC/USEPA/US@EPA, Lynn Zipf/DC/USEPA/US@EPA, Joe Beaman/DC/USEPA/US@EPA, Betsy Behl/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA, Tom Lavery/DC/USEPA/US@EPA, Grace Robiou/DC/USEPA/US@EPA, Maryt Smith/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Mark Pollins/DC/USEPA/US@EPA, Steven Neugeboren/DC/USEPA/US@EPA
Date: 12/15/2010 05:00 PM
Subject: Draft agenda for long-term MTM meeting Monday 12/20, 4-5 pm

Hi everyone,

Nancy has scheduled a follow-up meeting on long-term MTM options for next Monday, December 20 from 4-5 pm. In prep for that meeting, we wanted to send out a straw agenda to get feedback and aid in your preparation for the meeting.

As you may remember, we had an initial meeting on this topic on October 29. As framed in the proposed draft agenda, we're suggesting a focus on updates to the topics discussed on the 29th, more detail on the topics not covered on the 29th, and a brief discussion of next steps in the context of revising the April 1 guidance by April 1, 2011.

Please review the attached draft agenda and let Matt and me know your thoughts. We'll turn this into a final version later this week in preparation for Monday's meeting. We recognize that Mark, Adam, and Cynthia are invited from OECA this time around, so we would particularly welcome a way to add enforcement topics to this agenda as well.

I've also attached the issue paper we pulled together for the last meeting. Please update this document as appropriate with progress on these efforts (if appropriate) since our prior meeting.

Thanks,
Greg



ATTACHMENT REDACTED - DELIBERATIVE

Dec 20 Draft Agenda -- Long Term MTM Options.docx



ATTACHMENT REDACTED - DELIBERATIVE

Preliminary Policy Options for Addressing Surface Coal Mining (Draft 10-28-10).doc

Gregory E. Peck
Chief of Staff
Office of Water
U.S. Environmental Protection Agency

**Jessica
Martinsen/R3/USEPA/US**
12/15/2010 05:33 PM

To Brian Topping, Brian Frazer
cc Alaina DeGeorgio, Allison Graham, Jeffrey Lapp, Stefania
Shamet
bcc
Subject Draft Comment letter for ICG Tioga #3

Brian and Brian,

I am sending this to you in Chris' absence for HQ review and recommended comments/edits. Comments are due to the Corps on Tuesday December 21. If it's possible, I am hoping for comments back by COB Friday. Thank you for your review and assistance. If you have any questions please let me know.

ICG Eastern LLC's proposed Tioga #3 Surface Mine is located near Tioga, Nicholas County, West Virginia. The project proposes to utilize the mine through method of coal extraction, resulting in impacts to 4,094 lf of intermittent stream and 1,977 of ephemeral stream. There are no valley fills proposed on this project.



ATTACHMENT REDACTED - DELIBERATIVE

Tioga #3_12-15-10.doc

Jessica Martinsen
U.S. EPA Region III
Office of Environmental Programs
1650 Arch St. (3EA30)
Philadelphia, PA 19103
215-814-5144 (office)
215-814-2783 (fax)

**Steven
Neugeboren/DC/USEPA/US**

12/15/2010 06:05 PM

To Gregory Peck

cc

bcc

Subject Re: Draft agenda for long-term MTM meeting Monday 12/20,
4-5 pm

Greg - I haven't seen an invite yet for this.

Karyn/Kevin - forwarding to you.

Steve Neugeboren
Associate General Counsel
Water Law Office
EPA Office of General Counsel
202-564-5488
fax 202-564-5477

-----Gregory Peck/DC/USEPA/US wrote: -----

To: Denise Keehner/DC/USEPA/US@EPA, Ephraim King/DC/USEPA/US@EPA, Jim Hanlon/DC/USEPA/US@EPA, Adam Kushner/DC/USEPA/US@EPA
From: Gregory Peck/DC/USEPA/US
Date: 12/15/2010 05:00PM
Cc: Nancy Stoner/DC/USEPA/US@EPA, Benita Best-Wong/DC/USEPA/US@EPA, Randy Hill/DC/USEPA/US@EPA, Jeff Lape/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EPA, Louis Eby/DC/USEPA/US@EPA, Lynn Zipf/DC/USEPA/US@EPA, Joe Beaman/DC/USEPA/US@EPA, Betsy Behl/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA, Tom Laverty/DC/USEPA/US@EPA, Grace Robiou/DC/USEPA/US@EPA, Maryt Smith/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Mark Pollins/DC/USEPA/US@EPA, Steven Neugeboren/DC/USEPA/US@EPA
Subject: Draft agenda for long-term MTM meeting Monday 12/20, 4-5 pm

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I've also attached the issue paper we pulled together for the last meeting. Please

update this document as appropriate with progress on these efforts (if appropriate) since our prior meeting.


Thanks,
Greg

(See attached file: Dec 20 Draft Agenda -- Long Term MTM Options.docx)

(See attached file: Preliminary Policy Options for Addressing Surface Coal Mining (Draft 10-28-10).doc)

Gregory E. Peck
Chief of Staff
Office of Water

U.S. Environmental Protection Agency  - Dec 20 Draft Agenda -- Long Term MTM Options.docx

 - Preliminary Policy Options for Addressing Surface Coal Mining (Draft 10-28-10).doc

Documents Withheld-FOIA(b)(5)

Stefania
Shamet/R3/USEPA/US
12/15/2011 12:05 PM

To Francisco Cruz
cc Amy Bergdale, Barbara Rudnick, Bette Conway, Chad Harsh,
David McGuigan, Douglas Frankenthaler, Evelyn MacKnight,
Greg Pond, Jaclyn McIlwain, Jessica Martinsen, John Forren,
John Pomponio, Jon Capacasa, Linda Boornazian, Mark
Douglas, Nina Rivera, Stephen Field, Michael DAndrea
bcc
Subject Re: Draft Buffalo Mountain Interim Response Letter - Region
III Internal Distribution

Francisco -- Here are my comments on the draft. I moved a couple of paragraphs; tried to add the caveats we discussed yesterday, and tried to add a couple of placeholders for some of the issues we discussed yesterday. You'll see in my notes that I'm still running a couple of things down, but wanted to get this to you ASAP.



ATTACHMENT REDACTED - DELIBERATIVE

WV1029690 - Consol of Kentucky Inc - Buffalo Mountain Surface Minesds121511am.doc

Francisco Cruz [Here is the draft interim response letter concerni...](#)

12/14/2011 12:15:00 PM

From: Francisco Cruz/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA, Evelyn MacKnight/R3/USEPA/US@EPA, Jessica
Martinsen/R3/USEPA/US, Jon Capacasa/R3/USEPA/US@EPA, Mark
Douglas/R3/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, Linda
Boornazian/R3/USEPA/US@EPA, Amy Bergdale/R3/USEPA/US@EPA, Greg
Pond/R3/USEPA/US@EPA, John Forren/R3/USEPA/US, David McGuigan/R3/USEPA/US@EPA,
Stephen Field/R3/USEPA/US@EPA, Douglas Frankenthaler/R3/USEPA/US, Nina
Rivera/R3/USEPA/US@EPA, Chad Harsh/R3/USEPA/US@EPA, Bette
Conway/R3/USEPA/US@EPA, Jaclyn McIlwain/R3/USEPA/US@EPA, Barbara
Rudnick/R3/USEPA/US@EPA
Date: 12/14/2011 12:15 PM
Subject: Draft Buffalo Mountain Interim Response Letter - Region III Internal Distribution

Here is the draft interim response letter concerning Buffalo Mountain draft NPDES permit. We would like to finalize this letter by Friday, so we can send it to WV. (b) (5)

[REDACTED]

Thanks,

Francisco Cruz, P.E.
Environmental Engineer
NPDES Permits Branch (3WP41)
Office of Permits and Enforcement
Tel.: 215/814-5734
Fax: 215/814-2302

[attachment "WV1029690 - Consol of Kentucky Inc - Buffalo Mountain Surface Mine.doc" deleted by
Stefania Shamet/R3/USEPA/US]

Brian Topping/DC/USEPA/US

12/16/2010 07:56 AM

To Matthew Klasen

cc

bcc

Subject Mining Presentation from 8-3-09

Matt,

Here is the presentation for Pete from 8-3-09. This morning is full but we can talk later today or tomorrow when I'll be working from home.

Thanks,

Brian



ATTACHMENT REDACTED - DELIBERATIVE

Mining_AAO'W' briefing_8-3-09.ppt

Brian Topping

US Environmental Protection Agency

Wetlands Division, Room 7231

Office: 202-566-5680, FAX: 202-566-1375

Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460

Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004

topping.brian@epa.gov

Jeffrey Lapp/R3/USEPA/US

12/16/2010 08:55 AM

To John Pomponio, John Krakowiak

cc

bcc

Subject Fw: Draft Comment letter for ICG Tioga #3

Randy - Attached is a draft mine comment letter. As you see we have forwarded this on to HQ and I am sending you a copy (Alaina dropped off a hard copy) for your review. This is a mine through job which we currently have for my signature.

Please let us know if you have any comments or questions.

Thanks,
Jeff

----- Forwarded by Jeffrey Lapp/R3/USEPA/US on 12/16/2010 08:52 AM -----

From: Jessica Martinsen/R3/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA
Cc: Alaina DeGeorgio/R3/USEPA/US@EPA, Allison Graham/R3/USEPA/US@EPA, Jeffrey Lapp/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/15/2010 05:33 PM
Subject: Draft Comment letter for ICG Tioga #3

Brian and Brian,

I am sending this to you in Chris' absence for HQ review and recommended comments/edits. Comments are due to the Corps on Tuesday December 21. If it's possible, I am hoping for comments back by COB Friday. Thank you for your review and assistance. If you have any questions please let me know.

ICG Eastern LLC's proposed Tioga #3 Surface Mine is located near Tioga, Nicholas County, West Virginia. The project proposes to utilize the mine through method of coal extraction, resulting in impacts to 4,094 lf of intermittent stream and 1,977 of ephemeral stream. There are no valley fills proposed on this project.



ATTACHMENT REDACTED - DELIBERATIVE

Tioga #3_12-15-10.doc

Jessica Martinsen
U.S. EPA Region III
Office of Environmental Programs
1650 Arch St. (3EA30)
Philadelphia, PA 19103
215-814-5144 (office)
215-814-2783 (fax)

**Ross
Geredien/DC/USEPA/US**
12/16/2010 11:20 AM

To Marcel Tchaou
cc Christopher Hunter, Julia McCarthy, Palmer Hough
bcc
Subject Consolidated Coments: 307



ATTACHMENT REDACTED - DELIBERATIVE

Hunton-Williams Consolidated Comments.docx

307 comments in total. This may change as we find redundancy.
Let the cross-walking begin!!

Ross

Ross Geredien
ORISE Fellow
EPA Office of Wetlands, Oceans, and Watersheds
202-566-1466
Geredien.ross(AT)epa.gov

Marcel Tchaou

[These are my comments from the Hunton-Willia...](#)

12/15/2010 06:41:39 PM

From: Marcel Tchaou/DC/USEPA/US
To: Ross Geredien/DC/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Julia McCarthy/R8/USEPA/US@EPA
Date: 12/15/2010 06:41 PM
Subject: Re: Hunton-Williams comments

These are my comments from the Hunton-Williams document

[attachment "Hunton-Williams Marcel version.doc" deleted by Ross Geredien/DC/USEPA/US]

Marcel K. Tchaou, Ph.D., P.E., P.H.
Environmental Engineer
Wetlands & Aquatic Resources Regulatory Branch
Office of Wetlands, Oceans and Watersheds
U.S. EPA
1200 Pennsylvania Avenue, NW (MC 4502T)
Washington, DC 20460
202-566-1904

Julia McCarthy

[Here are mine! Julia McCarthy on detail to USE...](#)

12/15/2010 01:54:31 PM

From: Julia McCarthy/R8/USEPA/US

To: Ross Geredien/DC/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, Marcel Tchaou/DC/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA
Date: 12/15/2010 01:54 PM
Subject: Re: Hunton-Williams comments

Here are mine!

[attachment "Response to Comments.jmm.doc" deleted by Marcel Tchaou/DC/USEPA/US]

Julia McCarthy
on detail to USEPA Headquarters
Office of Wetlands, Oceans and Watersheds
(202) 566-1660
mccarthy.julia@epa.gov

A land ethic, then, reflects the existence of an ecological conscience, and this in turn reflects a connection of individual responsibility for the health of the land. Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity. ~Aldo Leopold

Ross Geredien

Here are my broken out comments: Ross Geredien

12/15/2010 09:02:25 AM

From: Ross Geredien/DC/USEPA/US
To: Palmer Hough/DC/USEPA/US@EPA, Julia McCarthy/R8/USEPA/US@EPA, Marcel Tchaou/DC/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA
Date: 12/15/2010 09:02 AM
Subject: Hunton-Williams comments

Here are my broken out comments:

[attachment "Hunton Williams Comments.docx" deleted by Julia McCarthy/R8/USEPA/US]

Ross Geredien
ORISE Fellow
EPA Office of Wetlands, Oceans, and Watersheds
202-566-1466
Geredien.ross(AT)epa.gov

Brian Topping/DC/USEPA/US

12/16/2010 11:21 AM

To Brian Frazer

cc

bcc

Subject Agenda for Mining Long Term Strategy today



LongTermStrategy.docx

Document Withheld - FOIA (b)(b)

Still working on the spreadsheet - I will bring copies of both.

Brian Topping

US Environmental Protection Agency

Wetlands Division, Room 7231

Office: 202-566-5680, FAX: 202-566-1375

Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460

Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004

topping.brian@epa.gov

Mark Nuhfer/R4/USEPA/US

12/16/2010 12:46 PM

To Evelyn MacKnight

cc Chris Thomas, Deborah Nagle, Denis Borum, Diane Jones-Coleman, Gregory Peck, Jon Capacasa, Js Wilson, Kevin Minoli, Linda Boornazian, Marcus Zobrist, Matthew Klasen, MichaelG Lee, Sharmin Syed, Stefania Shamet, Tom Lavery

bcc

Subject Re: Rahall incoming re: EPA 402 actions in Appalachia/WV (requesting R3 draft answers by COB Friday)

A few comments and suggestions. Thanks for the chance to provide input

Mark Nuhfer, Chief
Municipal and Industrial NPDES Section
EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303
404-562-9390
404-562-8692 (FAX)
nuhfer.mark@epa.gov

1. Be helpful. Listen to your customers.
2. Respond to all phone calls by the end of the next business day.
3. Respond to all correspondence within 10 business days.
4. Make clear, timely, accurate information accessible.
5. Work collaboratively with partners to improve products and services.
6. Involve customers and use their ideas and input!

Evelyn MacKnight

Here is the latest version. I have only gotten co...

12/16/2010 11:53:00 AM

From: Evelyn MacKnight/R3/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Cc: Deborah Nagle/DC/USEPA/US@EPA, Denis Borum/DC/USEPA/US@EPA, Diane Jones-Coleman/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Jon Capacasa/R3/USEPA/US@EPA, Js Wilson/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Sharmin Syed/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Tom Lavery/DC/USEPA/US@EPA, Linda Boornazian/DC/USEPA/US@EPA, Chris Thomas/R4/USEPA/US@EPA, Mark Nuhfer/R4/USEPA/US@EPA
Date: 12/16/2010 11:53 AM
Subject: Re: Rahall incoming re: EPA 402 actions in Appalachia/WV (requesting R3 draft answers by COB Friday)

Here is the latest version. I have only gotten comments from Stef Shamet and Nina Rivera so far.



ATTACHMENT REDACTED - DELIBERATIVE

Rahall Letter re WV Mining Permit Oversight 12 16 10.doc I am leaving for the day and will not be in tomorrow, but will check email.

Evelyn S. MacKnight

Chief, NPDES Permits Branch (3WP41)
Water Protection Division
Phone: 215-814-5717
Fax: 215-814-2301
email: macknight.evelyn@epa.gov

Matthew Klasen

Evelyn and Stef: The Administrator received a le...

12/14/2010 08:48:33 AM

From: Matthew Klasen/DC/USEPA/US
To: Evelyn MacKnight/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Cc: Denis Borum/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Diane Jones-Coleman/DC/USEPA/US@EPA, Jon Capacasa/R3/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Tom Lavery/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA, Sharmin Syed/DC/USEPA/US@EPA, Js Wilson/DC/USEPA/US@EPA, MichaelG Lee/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA
Date: 12/14/2010 08:48 AM
Subject: Rahall incoming re: EPA 402 actions in Appalachia/WV (requesting R3 draft answers by COB Friday)

Evelyn and Stef:

The Administrator received a letter from Chairman Rahall last week regarding EPA's actions in reviewing Section 402 permits in Appalachia, and asking specific questions about the review process in WV. The letter is attached below, and is in CMS under control # AL-10-002-0308.

Given the letter's detailed focus on permit reviews in R3, I think it makes sense for R3 to take a first shot at answering the letter's specific questions (pasted below), and for Shawn to be the presumed signatory of the response. Given the detailed nature of the questions and the need for consistency, however, I'm sure we in HQ (and Region 4) should be involved in reviewing the responses.

I'd like to see whether R3 could pull together draft responses to these questions by **COB Friday (12/18)** so that we can coordinate review among HQ and R4 early next week, and meet the 12/24 response date. Please let me know if this is a problem. We can discuss this on the mining call at 10:30 if there are any questions.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229



ATTACHMENT REDACTED - DELIBERATIVE

10-002-0308 - Rahall NPDES Incoming.pdf

Rahall Questions (copied and pasted from the letter):

- What criteria or considerations are used in concurring or objecting to a state-issued permit? To what extent are conductivity or total dissolved solids part of the consideration? What communication is involved with the applicant, and with outside groups?
- How does the Region III office and EPA headquarters interact during the review process? Who directs the review? What authority does each office have to object to the decisions of

the other?

- How many objections (interim, general, and specific) has the EPA raised with Sec. 402 permits in West Virginia? How many other 402 permits are likely to raise objections by EPA?
- What is the timeline for resolving these objections? What arrangements might be established to expedite an application? What arrangements might be established to expedite resolution of any dispute(s) over an application? What are you doing to simplify and expedite the process? What progress have you made?

Palmer Hough/DC/USEPA/US

To: Brian Frazer

12/16/2010 02:38 PM

cc

bcc

Subject: Fw: just a reminder to send me the latest FD - thanks!

Here is the version I just sent Karyn earlier. She is going to mark it up by hand and send me her comments so they will be easy for me to find.

-P

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

----- Forwarded by Palmer Hough/DC/USEPA/US on 12/16/2010 02:36 PM -----

From: Palmer Hough/DC/USEPA/US
To: Karyn Wendelowski/DC/USEPA/US@EPA
Date: 12/16/2010 12:31 PM
Subject: Re: just a reminder to send me the latest FD - thanks!

Karyn:

Here you go. Let me know when you would like to discuss.

-Palmer



ATTACHMENT REDACTED - DELIBERATIVE

Spill FD draft_working_v. doc

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

Karyn Wendelowski

12/16/2010 12:24:18 PM

From: Karyn Wendelowski/DC/USEPA/US

To: Palmer Hough/DC/USEPA/US@EPA
Date: 12/16/2010 12:24 PM
Subject: just a reminder to send me the latest FD - thanks!

Gregory Peck/DC/USEPA/US

12/16/2010 03:52 PM

To Amy Han

cc

bcc

Subject Re: BNA Materials

oops - too much going on!



ATTACHMENT REDACTED - DELIBERATIVE

Draft OW 2011 BNA Outlook Interview Talking Points 12-15-10 - mk.docx

Amy Han

Greg, can you attach the latest version? Amy Ha...

12/16/2010 03:42:27 PM

From: Amy Han/DC/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA
Date: 12/16/2010 03:42 PM
Subject: Re: BNA Materials

Greg, can you attach the latest version?

Amy Han
Office Of Water, Communications
U.S. Environmental Protection Agency
phone: 202-564-1196

Gregory Peck

With these edits - it looks good to go back over t...

12/16/2010 03:26:09 PM

From: Gregory Peck/DC/USEPA/US
To: Amy Han/DC/USEPA/US@EPA
Date: 12/16/2010 03:26 PM
Subject: BNA Materials

With these edits - it looks good to go back over to OPA.

Thanks,
Greg

David Rider/R3/USEPA/US
12/16/2010 05:26 PM

To Stefania Shamet
cc Carrie Traver, Frank Borsuk, John Forren, Margaret
Passmore, Nina Rivera, Regina Poeske
bcc
Subject Re: Help with Spruce

(b) (5)

Dave

Stefania Shamet

Thanks, Maggie. (b) (5)

12/16/2010 02:42:44 PM

From: Stefania Shamet/R3/USEPA/US
To: Margaret Passmore/R3/USEPA/US@EPA
Cc: Carrie Traver/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA, John
Forren/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, David
Rider/R3/USEPA/US@EPA, Nina Rivera/R3/USEPA/US@EPA
Date: 12/16/2010 02:42 PM
Subject: Re: Help with Spruce

Thanks, Maggie.

(b) (5)

Thanks.

Margaret Passmore

Frank is now on leave. Here's what I can clarify:

12/16/2010 02:23:10 PM

From: Margaret Passmore/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA
Cc: Carrie Traver/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA, John
Forren/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/16/2010 02:23 PM
Subject: Re: Help with Spruce

Frank is now on leave.

Here's what I can clarify:

(b) (5)

(b) (5)

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
Environmental Assessment and Innovation Division
USEPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
(p) 304-234-0245
(f) 304-234-0260
passmore.margaret@epa.gov

Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Stefania Shamet

If it makes you feel better, Maggie, John F., Dav...

12/16/2010 02:01:37 PM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA
Cc: Frank Borsuk/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/16/2010 02:01 PM
Subject: Re: Help with Spruce

If it makes you feel better, Maggie, John F., Dave and I are into our 12th year with Spruce Thanks again!

Carrie Traver

(b) (5)

12/16/2010 01:51:35 PM

From: Carrie Traver/R3/USEPA/US
To: Frank Borsuk/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/16/2010 01:51 PM
Subject: Re: Help with Spruce

(b) (5)

Carrie Traver
USEPA Region 3
Office of Environmental Programs
1650 Arch Street - 3EA30
Philadelphia, PA 19103

215-814-2772
traver.carrie@epa.gov

Stefania Shamet

(b) (5)

12/16/2010 01:38:57 PM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA
Cc: Regina Poeske/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA
Date: 12/16/2010 01:38 PM
Subject: Re: Help with Spruce

(b) (5)

Again, thanks to you both.

Carrie Traver

(b) (5)

12/16/2010 01:14:58 PM

From: Carrie Traver/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/16/2010 01:14 PM
Subject: Re: Help with Spruce

(b) (5)

■
■
■
■

(b) (5)

Hope that helps-
Carrie

Carrie Traver
USEPA Region 3
Office of Environmental Programs
1650 Arch Street - 3EA30
Philadelphia, PA 19103
215-814-2772
traver.carrie@epa.gov

Stefania Shamet

(b) (5)

12/16/2010 09:34:41 AM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA
Cc: Regina Poeske/R3/USEPA/US@EPA
Date: 12/16/2010 09:34 AM
Subject: Help with Spruce

(b) (5)

(b) (5)

[REDACTED]

[REDACTED]

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Brian Topping/DC/USEPA/US

12/17/2010 11:10 AM

To Brian Frazer

cc

bcc

Subject Fw: Draft Comment letter for ICG Tioga #3

Brian,

(b) (5)

Let me know if you would like me to reply directly to R3.

Brian



ATTACHMENT REDACTED - DELIBERATIVE

Tioga-3_12-15-10_BT.doc

Brian Topping

US Environmental Protection Agency

Wetlands Division, Room 7231

Office: 202-566-5680, FAX: 202-566-1375

Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460

Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004

topping.brian@epa.gov

----- Forwarded by Brian Topping/DC/USEPA/US on 12/17/2010 11:04 AM -----

From: Jessica Martinsen/R3/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA
Cc: Alaina DeGeorgio/R3/USEPA/US@EPA, Allison Graham/R3/USEPA/US@EPA, Jeffrey Lapp/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/15/2010 05:33 PM
Subject: Draft Comment letter for ICG Tioga #3

Brian and Brian,

I am sending this to you in Chris' absence for HQ review and recommended comments/edits. Comments are due to the Corps on Tuesday December 21. If it's possible, I am hoping for comments back by COB Friday. Thank you for your review and assistance. If you have any questions please let me know.

ICG Eastern LLC's proposed Tioga #3 Surface Mine is located near Tioga, Nicholas County, West Virginia. The project proposes to utilize the mine through method of coal extraction, resulting in impacts to 4,094 lf of intermittent stream and 1,977 of ephemeral stream. There are no valley fills proposed on this project.



ATTACHMENT REDACTED - DELIBERATIVE

Tioga #3_12-15-10.doc

Jessica Martinsen

U.S. EPA Region III

Office of Environmental Programs

1650 Arch St. (3EA30)

Philadelphia, PA 19103

215-814-5144 (office)

215-814-2783 (fax)

Palmer Hough/DC/USEPA/US

12/17/2010 01:55 PM

To Karyn Wendelowski, Kevin Minoli, Gregory Peck, Matthew Klasen, Marcel Tchaou, Julia McCarthy, Ross Geredien, Brian Frazer

cc

bcc

Subject Fw: Revisions to some responses in 1-96

FYI - here are the complete versions of comments 1-96.

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

----- Forwarded by Palmer Hough/DC/USEPA/US on 12/17/2010 01:48 PM -----

From: Stefania Shamet/R3/USEPA/US
To: Palmer Hough/DC/USEPA/US@EPA
Cc: David Rider/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA
Date: 12/17/2010 12:36 PM
Subject: Revisions to some responses in 1-96

Palmer -- As promised, here are the revisions.



ATTACHMENT REDACTED - DELIBERATIVE

Wheeling questions_GP.doc

(b) (5)

[Redacted content]

[Redacted content]

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Palmer Hough/DC/USEPA/US

12/17/2010 05:17 PM

To Kevin Minoli, Matthew Klasen, Karyn Wendelowski

cc Gregory Peck, Brian Frazer

bcc

Subject New HW comments

Kevin/Karyn/Matt:

We divided up the 11-29-10 comments from HW and did an initial crosswalk and cut over half of the 300 11-29-10 HW comments out bc they are repeats from the PD. The attached documents highlight comments that our reviewers thought were not addressed in RTC materials sent by the Region thus far. As you can see these total approx 124.

How do you recommend we proceed next? Other, less conservative, reviewers might look at these highlighted 124 comments and conclude that more of these were in fact addressed in the draft RTC we have already gotten from the Region or they may be addressed in the materials that the Region sends over the weekend (remember we still have not seen comments 97-150 from the PD).

Although Stef and R3 staff would be a good judge for a second screening - should we ask that of them now?

-Palmer

Here is the rough breakdown:

1-68 has ~42 "new"

69-242 has ~34 "new"

242-301 has ~48 "new"



Hunton-Williams Comments_243-302.docx



Hunton-Williams Comments_1-68.doc



Hunton-Williams Comments_69-242.docx

ATTACHMENTS REDACTED - DELIBERATIVE

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

Palmer Hough/DC/USEPA/US

12/17/2010 07:40 PM

To Tanya Code

cc Brian Frazer, David Evans

bcc

Subject Latest Mark-up of Spruce FD for your Review

Tanya:

Sorry for not getting this to you sooner. This is the latest mark-up of the Spruce FD. I would really appreciate your review and very candid thoughts regarding what is lacking.

While I would like your edits redline - I'm worried that they will get lost in the sea of redline that is already in the document. Maybe you could highlight them some way.

I'm around all weekend. Monday before 11 am is my deadline for comments on this draft.

Thanks, Palmer



ATTACHMENT REDACTED - DELIBERATIVE

Spruce FD draft_working_v2.doc

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

Matthew
Klasen/DC/USEPA/US
12/18/2010 08:01 PM

To: Gregory Peck
cc
bcc
Subject: Re: First shot at a Spruce release

Here's a shot.

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Gregory Peck/DC/USEPA/US wrote: -----

To: Matthew Klasen/DC/USEPA/US@EPA
From: Gregory Peck/DC/USEPA/US
Date: 12/18/2010 07:34PM
Subject: Re: First shot at a Spruce release

Matt

Nice work. I made a few editorial changes - see what you think. (b) (5)

Thanks

(See attached file: 2010-12-18 Draft Spruce Release.docx)

Matthew Klasen---12/18/2010 06:31:35 PM---Hey Greg, Here's a first shot at Spruce release. (b) (5)

Fro: Matthew Klasen/DC/USEPA/US
m:
To: Gregory Peck/DC/USEPA/US@EPA
Dat: 12/18/2010 06:31 PM
e:
Sub: First shot at a Spruce release
ject
:

Hey Greg,

Here's a first shot at Spruce release. (b) (5)

(b) (5)

[REDACTED]


[REDACTED]

[REDACTED]

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229[attachment "2010-12-18 Draft Spruce Release.docx" deleted by
Gregory Peck/DC/USEPA/US]

[attachment "2010-12-18 Draft Spruce Release.docx" removed by Matthew

Klasen/DC/USEPA/US]  - 2010-12-18 Draft Spruce Release-1.docx

ATTACHMENT REDACTED - DELIBERATIVE

**Matthew
Klasen/DC/USEPA/US**

12/19/2010 11:17 AM

To Gregory Peck


cc

bcc

Subject Updated release

Here's a shot at more detailed bullets, including what I think we can say about human health.

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780

cell (202) 380-7229  - 2010-12-19 Draft Spruce Release.docx

ATTACHMENT REDACTED - DELIBERATIVE

Palmer Hough/DC/USEPA/US

To: Brian Frazer

12/19/2010 03:06 PM

cc: Christopher Hunter, David Evans, "Denise Keehner"

bcc:

Subject: Re: Fw: Draft Spruce PR

(b) (5)

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

Brian Frazer

FYI - Greg's first cut at the Spruce pres...

12/19/2010 12:05:40 PM

From: Brian Frazer/DC/USEPA/US
To: "Denise Keehner" <Keehner.Denise@epamail.epa.gov>, David Evans/DC/USEPA/US
Cc: Palmer Hough/DC/USEPA/US, Christopher Hunter/DC/USEPA/US
Date: 12/19/2010 12:05 PM
Subject: Fw: Draft Spruce PR

FYI - Greg's first cut at the Spruce press release and Q&As.

Brian Frazer
Chief, Wetlands & Aquatic Resources Regulatory Branch
O:202-566-1652
C:202-379-6906

Sent from my BlackBerry Wireless Handheld
Gregory Peck

----- Original Message -----

From: Gregory Peck
Sent: 12/19/2010 11:59 AM EST
To: Betsaida Alcantara; Brendan Gilfillan; Adora Andy;
ganesan.arvin@epa.gov
Cc: Peter Silva; Nancy Stoner; Bob Sussman; Matthew Klasen; Brian Frazer;
(b) (6) Kevin Minoli
Subject: Draft Spruce PR

Attached is an initial cut at a press release for the Spruce veto. Wanted to get you something early to begin chewing on. (b)(5) ACP We'll be working

on the remainder of the communications package during the next week, including Q's and A's, key messages, talking points, and outreach to coordinate support. Also working with Arvin and his staff. Shooting for a Dec 30th release.

We included a draft quote for Pete. Let us know if you want us to draft something for LPJ.

Feel free to call Matt or me if you have any questions.

Greg



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-19 Draft Spruce Release v.1.docx

Matthew
Klasen/DC/USEPA/US
12/20/2010 08:31 AM

To: Chris Thomas
cc
bcc
Subject: Re: Thoughts on KY permitting approach

Thanks Chris, and good news on the TN front! I'm sure a trip to KY would be instructive for me, so I'll look forward to updates (including ticket prices).

mk

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

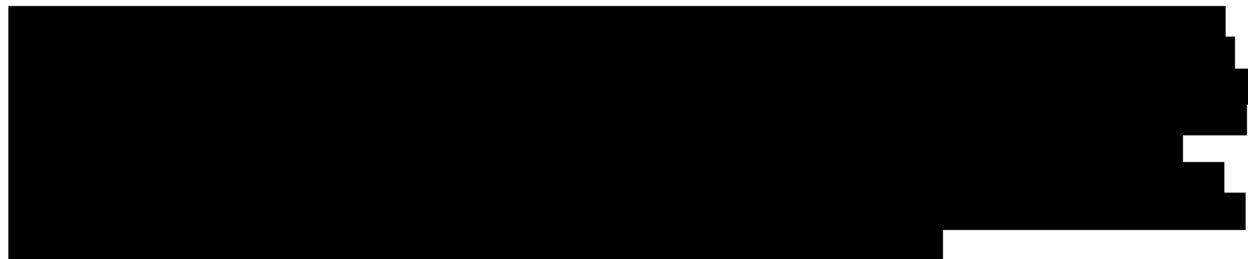
Chris Thomas

(b) (5)

12/20/2010 06:56:37 AM

From: Chris Thomas/R4/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA, Mark Nuhfer/R4/USEPA/US@EPA
Cc: Gregory Peck/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, "Jim Giattina" <giattina.jim@epa.gov>
Date: 12/20/2010 06:56 AM
Subject: Re: Thoughts on KY permitting approach

(b) (5)



Chris

Sent by EPA Wireless E-Mail Services

From: Matthew Klasen
Sent: 12/19/2010 07:30 PM EST
To: Marcus Zobrist; Mark Nuhfer; Chris Thomas
Cc: Gregory Peck; Kevin Minoli
Subject: Thoughts on KY permitting approach

Marcus, Mark, and Chris,

(b) (5)

[Redacted]

[Redacted]

[Redacted]

[Redacted]

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Matthew
Klasen/DC/USEPA/US
12/20/2010 08:32 AM

To: Matthew Klasen
cc
bcc
Subject: Re: Fw: Draft Big Branch letter

1 attachment



ATTACHMENT REDACTED - DELIBERATIVE

Letter to CAM draft 12.10.10 - mk.docx

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Gregory Peck/DC/USEPA/US wrote: -----

To: Karyn Wendelowski/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA
From: Gregory Peck/DC/USEPA/US
Date: 12/15/2010 02:48PM
Subject: Fw: Draft Big Branch letter

----- Forwarded by Gregory Peck/DC/USEPA/US on 12/15/2010 02:48 PM -----

From: Brian Frazer/DC/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA
Date: 12/15/2010 02:42 PM
Subject: Fw: Draft Big Branch letter

Per our discussion. I was told we requested to see the letter after the region mentioned it on the mining call yesterday. Let me know if you have any comments. I'm reviewing now.

bf

Brian M. Frazer, Chief
Wetlands & Aquatic Resources Regulatory Branch
Office of Wetlands, Oceans and Watersheds
U.S. EPA
1200 Pennsylvania Avenue, NW (MC 4502T)
Washington, DC 20460
202-566-1652

----- Forwarded by Brian Frazer/DC/USEPA/US on 12/15/2010 02:41 PM -----

From: Tom Welborn/R4/USEPA/US
To: David Evans/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Brian
Topping/DC/USEPA/US@EPA
Cc: Duncan Powell/R4/USEPA/US@EPA, Todd Bowers/R4/USEPA/US@EPA, Philip
Mancusi-Ungaro/R4/USEPA/US@EPA
Date: 12/14/2010 11:28 AM
Subject: Draft Big Branch letter
:

Here is our draft letter. We may change it to my signature since Jim is headed out the door after today.

(See attached file: Letter to CAM draft 12.10.10.docx)

Tom Welborn, Chief
Wetlands, Coastal and Oceans Branch
EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303
404-562-9354
404-562-9343(FAX)
404-895-6312(cell)

[attachment "Letter to CAM draft 12.10.10.docx" removed by Matthew Klasen/DC/USEPA/US]

**Matthew
Klasen/DC/USEPA/US**
12/20/2010 08:36 AM

To Gregory Peck
cc
bcc
Subject Fw: Rahall letter

Hey Greg,

Did you have a chance to look at this? Should I send around to the group so folks can look at it (before vacation time starts in earnest)?

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/20/2010 08:35 AM -----

From: Matthew Klasen/DC/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA
Date: 12/17/2010 04:48 PM
Subject: Rahall letter

Here it is -- let me know your thoughts. I had to do a lot more editing than I'd expected. As usual, there was a lot of unnecessary detail in here (you might still think there's too much), and so i tried to pare things own to more directly answer the questions.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780



ATTACHMENT REDACTED - DELIBERATIVE

cell (202) 380-7229 2010-12-17 Draft Rahall Response.docx

**Jessica
Martinsen/R3/USEPA/US**

12/20/2010 09:12 AM

To Alaina DeGeorgio, Allison Graham

cc

bcc

Subject Fw: News regarding review of Tioga #3 comment letter?

Here we go. I guess it's HQ approved for signature. I'll check with Randy to find out if Bill Early needs a copy too today. Thanks!

Jessica Martinsen
U.S. EPA Region III
Office of Environmental Programs
1650 Arch St. (3EA30)
Philadelphia, PA 19103
215-814-5144 (office)
215-814-2783 (fax)

----- Forwarded by Jessica Martinsen/R3/USEPA/US on 12/20/2010 09:11 AM -----

From: Brian Topping/DC/USEPA/US
To: Brian Frazer/DC/USEPA/US@EPA, Jeffrey Lapp/R3/USEPA/US@EPA, Jessica
Martinsen/R3/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA
Date: 12/20/2010 08:55 AM
Subject: Re: News regarding review of Tioga #3 comment letter?

Jessica,
Here are our relatively minor edits to the comment letter. Let me know if you have any questions and please send us a copy of the final signed version.
Thanks,
Brian



ATTACHMENT REDACTED - DELIBERATIVE

Tioga-3_12-15-10_BT.doc

Brian Topping
US Environmental Protection Agency
Wetlands Division, Room 7231
Office: 202-566-5680, FAX: 202-566-1375
Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460
Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004
topping.brian@epa.gov

Brian Frazer

Jessica - I received Brian's edits this morning an...

12/17/2010 03:24:32 PM

From: Brian Frazer/DC/USEPA/US
To: Jessica Martinsen/R3/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA
Cc: Jeffrey Lapp/R3/USEPA/US@EPA
Date: 12/17/2010 03:24 PM
Subject: Re: News regarding review of Tioga #3 comment letter?

Jessica - I received Brian's edits this morning and will send mine on top of his by Sunday. Thought I would be able to get to this today....no such luck.

Will that work?

Brian Frazer
Chief, Wetlands & Aquatic Resources Regulatory Branch
O:202-566-1652
C:202-379-6906

Sent from my BlackBerry Wireless Handheld

Jessica Martinsen

----- Original Message -----

From: Jessica Martinsen

Sent: 12/17/2010 03:21 PM EST

To: Brian Topping

Cc: Brian Frazer; Jeffrey Lapp

Subject: News regarding review of Tioga #3 comment letter?

Good Friday Afternoon!!

I just wanted to check on the status regarding the HQ review for the Tioga #3 comment letter for the mine-through project. News? Thank you!

Jessica Martinsen
U.S. EPA Region III
Office of Environmental Programs
1650 Arch St. (3EA30)
Philadelphia, PA 19103
215-814-5144 (office)
215-814-2783 (fax)

Karyn
Wendelowski/DC/USEPA/US
12/20/2010 09:57 AM

To Palmer Hough
cc Christopher Hunter
bcc
Subject Fw: Fwd: Spruce

Palmer - In order to review comments, Ann Williams did a quick review of the FD. Unfortunately her comments are in redline on your already redlined document (look for annwilli), but they seem very useful for the next draft.

I have a question for you - since the appendices are so important for the guidelines discussion in the FD, should I review those three today if I get a chance or have you made a lot of changes and I should just wait?

-----Forwarded by Karyn Wendelowski/DC/USEPA/US on 12/20/2010
09:39AM -----

To: Karyn Wendelowski/DC/USEPA/US@EPA
From: kevin minoli (b)(6) Kevin Minoli
Date: 12/19/2010 06:38PM
Subject: Fwd: Spruce
(See attached file: Spruce FD draft_working_v2.clean(AW edits).doc)

----- Forwarded message -----

From: "Ann Williams" (b) (6) Ann Williams
Date: Dec 19, 2010 6:15 PM
Subject: Spruce
To: "kevin minoli" (b) (6) Kevin Minoli, <minoli.kevin@epa.gov>, <williams.ann@epa.gov>

Hi Kevin,
I've commented up until the discussion of the guidelines. I have more comments on the last sections but this is all I'm able to do today. I keep misspelling Karyn's email address; can you please forward this to her?
Thanks,

Ann ATTACHMENT REDACTED - DELIBERATIVE



- Spruce FD draft_working_v2.clean(AW edits).doc

Marcus
Zobrist/DC/USEPA/US
12/20/2010 10:56 AM

To Sharmin Syed
cc
bcc
Subject Fw: Draft agenda for long-term MTM meeting Monday 12/20,
4-5 pm

Marcus Zobrist, Chief
Industrial Branch
Water Permits Division
Office of Wastewater Management
US EPA Office of Water
202-564-8311
Zobrist.Marcus@epa.gov

----- Forwarded by Marcus Zobrist/DC/USEPA/US on 12/20/2010 10:56 AM -----

From: Randy Hill/DC/USEPA/US
To: Deborah Nagle/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA
Cc: Tom Lavery/DC/USEPA/US@EPA
Date: 12/20/2010 09:22 AM
Subject: Fw: Draft agenda for long-term MTM meeting Monday 12/20, 4-5 pm

(b) (5)



Randy Hill
Deputy Director
Office of Wastewater Management
U.S. EPA (4201M)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460
(202) 564-0748
(202) 501-2338 (FAX)
hill.randy@epa.gov

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----- Forwarded by Randy Hill/DC/USEPA/US on 12/20/2010 09:14 AM -----

From: Gregory Peck/DC/USEPA/US
To: Denise Keehner/DC/USEPA/US@EPA, Ephraim King/DC/USEPA/US@EPA, Jim Hanlon/DC/USEPA/US@EPA, Adam Kushner/DC/USEPA/US@EPA
Cc: Nancy Stoner/DC/USEPA/US@EPA, Benita Best-Wong/DC/USEPA/US@EPA, Randy Hill/DC/USEPA/US@EPA, Jeff Lape/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EPA, Louis Eby/DC/USEPA/US@EPA, Lynn Zipf/DC/USEPA/US@EPA, Joe Beaman/DC/USEPA/US@EPA, Betsy Behl/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Deborah Nagle/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA, Tom Lavery/DC/USEPA/US@EPA, Grace Robiou/DC/USEPA/US@EPA, Maryt Smith/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Mark Pollins/DC/USEPA/US@EPA, Steven Neugeboren/DC/USEPA/US@EPA
Date: 12/15/2010 05:00 PM
Subject: Draft agenda for long-term MTM meeting Monday 12/20, 4-5 pm

Hi everyone,

Nancy has scheduled a follow-up meeting on long-term MTM options for next Monday, December 20 from 4-5 pm. In prep for that meeting, we wanted to send out a straw agenda to get feedback and aid in your preparation for the meeting.

As you may remember, we had an initial meeting on this topic on October 29. As framed in the proposed draft agenda, we're suggesting a focus on updates to the topics discussed on the 29th, more detail on the topics not covered on the 29th, and a brief discussion of next steps in the context of revising the April 1 guidance by April 1, 2011.

Please review the attached draft agenda and let Matt and me know your thoughts. We'll turn this into a final version later this week in preparation for Monday's meeting. We recognize that Mark, Adam, and Cynthia are invited from OECA this time around, so we would particularly welcome a way to add enforcement topics to this agenda as well.

I've also attached the issue paper we pulled together for the last meeting. Please update this document as appropriate with progress on these efforts (if appropriate) since our prior meeting.

Thanks,
Greg



ATTACHMENT REDACTED - DELIBERATIVE

Dec 20 Draft Agenda -- Long Term MTM Options.docx



ATTACHMENT REDACTED - DELIBERATIVE

Preliminary Policy Options for Addressing Surface Coal Mining (Draft 10-28-10).doc

Gregory E. Peck
Chief of Staff
Office of Water
U.S. Environmental Protection Agency

**Alaina
DeGeorgio/R3/USEPA/US**
12/20/2010 12:11 PM

To Jessica Martinsen, Jeffrey Lapp
cc Allison Graham
bcc
Subject Tioga 3 Letter 12-20-10

Hey everyone,

Attached below is the most recent draft for Tioga #3. It incorporates the HQ comments as well as the most recent round of final edits.

Thanks,

Alaina



Document Withheld - FOIA (b)(5)

Tioga3_PN Comments_122010.doc

Alaina DeGeorgio
EPA Region III
1650 Arch St.
Philadelphia, PA
(215) 814-2741

Matthew
Klasen/DC/USEPA/US
12/20/2010 01:59 PM

To: Travis Loop
cc
bcc
Subject: Fw: Draft Spruce PR

FYI -- here's the draft release that Greg sent to folks last night.

mk

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/20/2010 01:58 PM -----

From: Gregory Peck/DC/USEPA/US
To: Betsaida Alcantara/DC/USEPA/US@EPA, Brendan Gilfillan/DC/USEPA/US@EPA, Adora
Andy/DC/USEPA/US@EPA, ganesan.arvin@epa.gov
Cc: Peter Silva/DC/USEPA/US@EPA, Nancy Stoner/DC/USEPA/US@EPA, Bob
Sussman/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Brian
Frazer/DC/USEPA/US@EPA, (b)(6) Kevin Minoli
Date: 12/19/2010 11:59 AM
Subject: Draft Spruce PR

Attached is an initial cut at a press release for the Spruce veto. Wanted to get you something early to begin chewing on (b) (5) ACP. We'll be working on the remainder of the communications package during the next week, including Q's and A's, key messages, talking points, and outreach to coordinate support. Also working with Arvin and his staff. Shooting for a Dec 30th release.

We included a draft quote for Pete. Let us know if you want us to draft something for LPJ.

Feel free to call Matt or me if you have any questions.

Greg



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-19 Draft Spruce Release v.1.docx

Matthew
Klasen/DC/USEPA/US
12/20/2010 02:07 PM

To Brian Frazer, David Evans, Denise Keehner
cc Tanya Code
bcc
Subject Fw: Briefing materials for the Administrator's briefing tomorrow

FYI -- here are the material for 2:15 pm, exclusively 402. Greg talked with R4 and they're going to focus on status updates, so no need for WD to be there.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/20/2010 02:06 PM -----

From: Gregory Peck/DC/USEPA/US
To: Kevin Minoli, Matthew Klasen/DC/USEPA/US@EPA
Date: 12/20/2010 11:21 AM
Subject: Fw: Briefing materials for the Administrator's briefing tomorrow

(b) (5)

(b) (5)

You can let folks know that I'd like to schedule a senior staff level discussion on this during the first week of January.

Thanks

----- Forwarded by Gregory Peck/DC/USEPA/US on 12/20/2010 11:16 AM -----

From: Stan Meiburg/R4/USEPA/US
To: Ryan Robison/DC/USEPA/US@EPA
Cc: Bob Sussman/DC/USEPA/US@EPA, Gwendolyn KeyesFleming/R4/USEPA/US@EPA, Jim Giattina/R4/USEPA/US@EPA, Chris Thomas/R4/USEPA/US@EPA, Kenneth Lapierre/R4/USEPA/US@EPA, Stoner.Nancy@epamail.epa.gov, silva.peter@epa.gov, peck.gregory@epa.gov, Georgia Bednar/DC/USEPA/US@EPA
Date: 12/20/2010 11:04 AM
Subject: Briefing materials for the Administrator's briefing tomorrow

Ryan, thanks for your call this morning. Per your request, here's the briefing we've prepared for the Administrator for tomorrow. We were supposed to have a pre-brief for Bob Sussman this afternoon, but I understand from email traffic this morning that the status of the pre-brief is in question. In any event, if there are any changes Bob would like to make to this, we'll find a way to get them to you.

Stan



ATTACHMENT REDACTED - DELIBERATIVE

Kentucky Coal Mines_AdminBriefing_121910 final.pptx

A. Stanley Meiburg
Deputy Regional Administrator
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Sam Nunn Atlanta Federal Center
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Healthier Families, Cleaner Communities, A Stronger America
<http://www.epa.gov/40th>

Palmer Hough/DC/USEPA/US

To Ross Geredien, Christopher Hunter, Marcel Tchaou

12/20/2010 03:16 PM

cc

bcc

Subject Fw: Golden algae and Spruce - References

FYI

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

----- Forwarded by Palmer Hough/DC/USEPA/US on 12/20/2010 03:16 PM -----

From: Louis Reynolds/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA
Cc: Carrie Traver/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA
Date: 12/20/2010 01:11 PM
Subject: Golden algae and Spruce - References

Not at all.

(b)(5) DPP ACP [Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]

lou



PparvumGrowthRate_FinalReport.pdf



Reservior symposium paper.pdf



Roelke et al 2010 (JPR online).pdf



B2009LO.pdf

Lou Reynolds
USEPA Region III
Freshwater Biology Team
1060 Chapline St. Ste. 303
Wheeling, WV 26003-2995
P 304-234-0244
F 304-234-0260

Stefania Shamet

Hey Lou. (b) (5) DPP ACP

12/20/2010 10:38:53 AM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA
Cc: John Forren/R3/USEPA/US@EPA, Louis Reynolds/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA
Date: 12/20/2010 10:38 AM
Subject: Re: ACK!!!!!!!!!!!! Golden algae and Spruce

Hey Lou. (b) (5) DPP ACP

Thanks. Sorry for beign a pain in the arse.

Carrie Traver

Lou, (b) (5) DPP ACP

12/20/2010 09:21:18 AM

From: Carrie Traver/R3/USEPA/US
To: Louis Reynolds/R3/USEPA/US@EPA
Cc: John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/20/2010 09:21 AM
Subject: Re: ACK!!!!!!!!!!!! Golden algae and Spruce

Lou,

(b) (5) DPP ACP

Thanks,
Carrie

Carrie Traver
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traver.carrie@epa.gov

Louis Reynolds

(b) (5) DPP ACP

12/20/2010 07:52:26 AM

From: Louis Reynolds/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA

Cc: Carrie Traver/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA
Date: 12/20/2010 07:52 AM
Subject: Re: ACK!!!!!!!!!!!! Golden algae and Spruce

(b) (5) DPP ACP

[ατταχημεντ √ΠπαρπωμΓροωτηΡατε_ΦιναλΡεπορτ.πδφ√ δελετεδ βψ Χαρριε Τραπερ/P3/ΥΣΕΠΙΑ/ΥΣ]

- Hambright 2010 was omitted from the reference list. The reference is: **Hambright, K. D. (2010) *Prymnesium parvum* Growth studies using the Dunkard Creek isolate (WANA strain).** Report submitted to: West Virginia Department of Environmental Protection Division of Water and Waste Management. Charleston, WV. Department of Zoology University of Oklahoma, Norman, OK.

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Stefania Shamet

Thanks Carrie (b) (5) DPP ACP

12/17/2010 02:16:37 PM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA
Cc: John Forren/R3/USEPA/US@EPA, Louis Reynolds/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA
Date: 12/17/2010 02:16 PM
Subject: Re: ACK!!!!!!!!!!!! Golden algae and Spruce

Thanks Carrie! (b) (5) DPP ACP

Thanks again and have a great weekend!

Carrie Traver

Stef, (b) (5) DPP ACP

12/17/2010 02:09:36 PM

From: Carrie Traver/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA
Cc: John Forren/R3/USEPA/US@EPA, Louis Reynolds/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA
Date: 12/17/2010 02:09 PM
Subject: Re: ACK!!!!!!!!!!!! Golden algae and Spruce

Stef,

(b) (5) DPP ACP

[attachment "Reference additions.doc" deleted by Stefania Shamet/R3/USEPA/US]
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Stefania Shamet

(b) (5) DPP ACP

12/17/2010 01:05:03 PM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Louis Reynolds/R3/USEPA/US@EPA
Cc: John Forren/R3/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA
Date: 12/17/2010 01:05 PM
Subject: ACK!!!!!!!!!!!! Golden algae and Spruce

(b) (5) DPP ACP

Thanks.

A decade of fish-killing *Prymnesium parvum* blooms in Texas: roles of inflow and salinity

DANIEL L. ROELKE^{1,2*}, JAMES P. GROVER³, BRYAN W. BROOKS⁴, JOAN GLASS⁵, DAVID BUZAN⁵, GREGORY M. SOUTHARD⁵, LORAIN FRIES⁵, GEORGE M. GABLE¹, LESLIE SCHWIERZKE-WADE¹, MERIDITH BYRD⁵ AND JANET NELSON⁵

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Received February 27, 2010; accepted in principle June 4, 2010; accepted for publication June 7, 2010

Corresponding editor: John Dolan

Fish killing *Prymnesium parvum* blooms have occurred in south central USA for at least ~30 years, with the last decade experiencing recurrent blooms of large magnitude. In the systems reported here, Lakes Possum Kingdom, Granbury and Whitney (Texas), *P. parvum* blooms were winter phenomena developing under conditions far from the growth optimum. Bloom thresholds of 10×10^6 cells L⁻¹ were observed as a function of inflow and salinity for the period 2000–2009. In Lake Possum Kingdom, blooms occurred only when 7 day accumulated inflows were $<10 \times 10^6$ m³ and salinities were >1.5 psu. For Lakes Granbury and Whitney, blooms occurred when 7 day accumulated inflows were $<20 \times 10^6$ m³ and $<40 \times 10^6$ m³, respectively, and salinities were >0.5 psu. Inflow to these lakes exceeded thresholds during the spring and early summer months in 8 (Lake Possum Kingdom), 7 (Lake Granbury) and 6 (Lake Whitney) of the 10 years analyzed. Salinities typically exceeded these thresholds during the period of study prior to the spring of 2007. The spring of 2007 was a period of high precipitation, after which salinities were typically below thresholds. The linkage between incidence of *P. parvum* blooms, inflows and salinity is of concern because combined effects from human population increase and climate change could lead to periods of decreased inflow and increased salinity, which may then increase the frequency and magnitude of *P. parvum* blooms.

KEYWORDS: Haptophyte; fish kill; bloom; hydraulic flushing; salinity

INTRODUCTION

Inflows and salinity have long been recognized as factors influencing phytoplankton community dynamics and structure (Ketchum, 1951, 1954). The magnitude and timing of inflows produce nutrient pulse and flushing loss variations that select for species adapted for

these conditions, which in turn influence plankton community composition and productivity (Roelke *et al.*, 2003; Buyukates and Roelke, 2005; Miller *et al.*, 2008). Nutrient pulses and flushing losses associated with inflows also have been linked to the incidence of harmful algal blooms (Seliger *et al.*, 1970; Anderson and

Stolzenbach, 1985; Paerl, 1988; Jacoby *et al.*, 2000; Moustaka Gouni *et al.*, 2006; Mitrovic *et al.*, 2008), including a toxic bloom of *Prymnesium parvum* (Roelke *et al.*, 2010a).

Prymnesium parvum, a haptophyte alga, occurs world wide. It is tolerant of large variations in temperature and salinity, and is capable of forming large fish killing blooms (Lundholm and Moestrup, 2006; Baker *et al.*, 2007, 2009; Southard *et al.*, 2010). In the USA, the first recorded *P. parvum* bloom occurred in 1985 in a semi arid region of the country (Pecos River, Texas) (James

and De La Cruz, 1989). Since then, the incidence of *P. parvum* blooms dramatically increased in the USA, where the organism has invaded lakes and rivers throughout southern regions and most recently into northern regions (Fig. 1). *Prymnesium parvum* blooms typically occur in aquatic systems that are eutrophic and brackish (Kaartvedt *et al.*, 1991; Guo *et al.*, 1996; Roelke *et al.*, 2007a, 2010a, b; Hambright *et al.*, 2010).

Many factors likely contribute to *P. parvum* bloom formation. They include production of chemicals toxic to grazers (Granéli and Johansson, 2003; Tillmann, 2003;

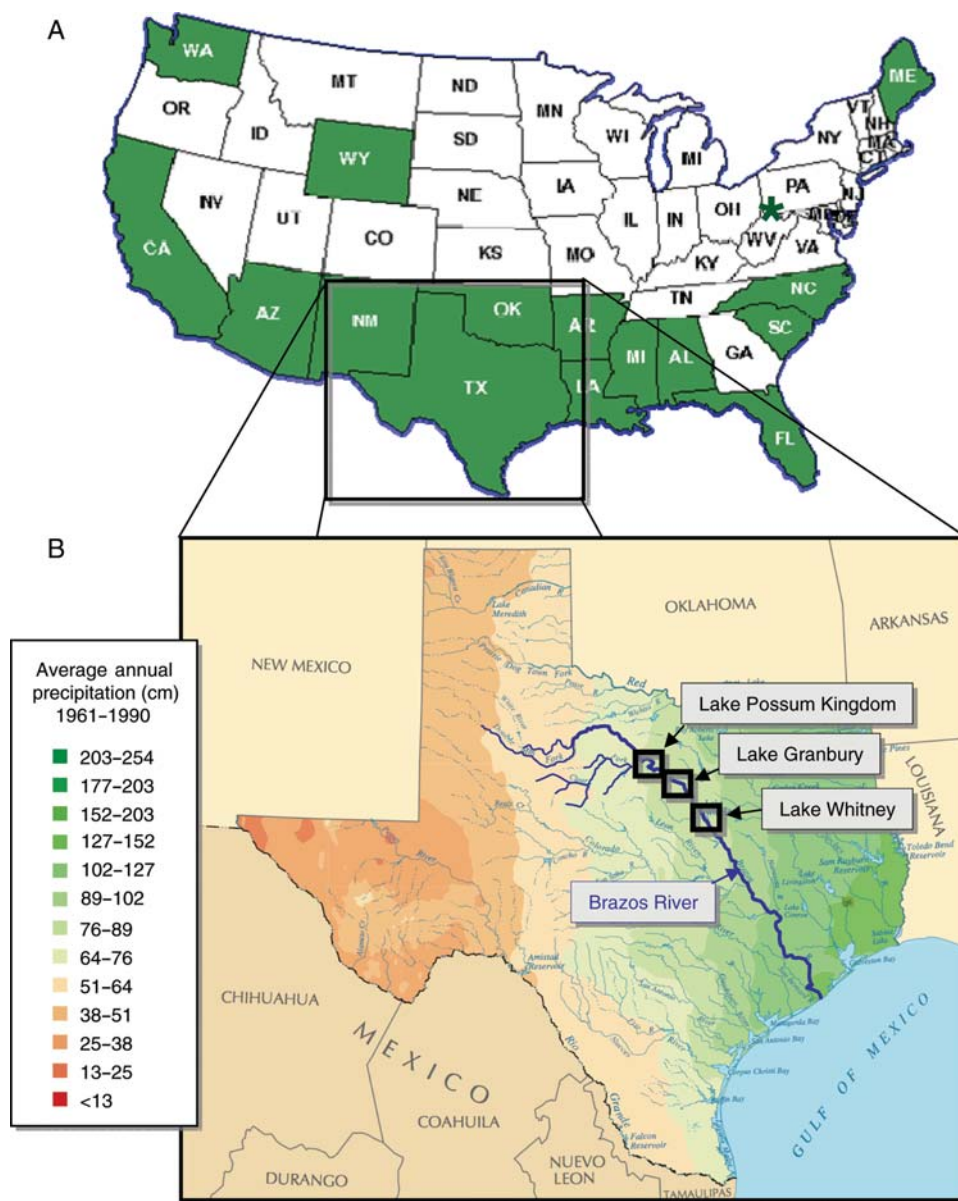


Fig. 1. States in the USA where *Prymnesium parvum* was confirmed (modified from Sager *et al.*, 2008) where the asterisk indicates the most recent northward spread of this invasive species (A), and the east–west precipitation gradient across Texas (B) (from The National Atlas of the United States of America, US Department of the Interior and US Geological Survey). The three lakes studied for this research included Lakes Possum Kingdom, Granbury and Whitney (Texas), situated along the Brazos River in an area receiving ~ 90 cm year⁻¹ of rainfall.

Barreiro *et al.*, 2005; Michaloudi *et al.*, 2009; Brooks *et al.*, 2010), use of alternative energy and nutrient sources through mixotrophy and saprophytic nourishment (Nygaard and Tobiesen, 1993; Skovgaard and Hansen, 2003; Lindehoff *et al.*, 2009), suppression of competitors through allelopathy (Fistarol *et al.*, 2003, 2005; Granéli and Johansson, 2003; Roelke *et al.*, 2007a; Errera *et al.*, 2008) and resistance to the allelopathic effects of other algae (Suikkanen *et al.*, 2004; Tillmann *et al.*, 2007). Factors that negatively influence *P. parvum* population density might include grazing by toxin resistant zooplankton and pathogenic effects of virus (Schwierzke *et al.*, 2010). In addition, some cyanobacteria may inhibit *P. parvum* blooms (Grover *et al.*, 2010; Roelke *et al.*, 2010b; James *et al.*, in review).

In regards to inflow and salinity, both have been shown as important factors influencing *P. parvum* population dynamics and reproductive growth rates. A recent study documenting the entire seasonal *P. parvum* bloom cycle in a Texas lake found that cell loss through hydraulic flushing during a period of high inflow, along with cessation of toxin production associated with nutrient loading, was the primary mechanism terminating the bloom (Roelke *et al.*, 2010a). In regards to salinity, using a Texas strain of *P. parvum* (UTEX LL 2797), the optimal salinity for reproductive growth was determined to be 22 psu. At 10°C, a temperature representative of winter conditions when blooms are most common in the region, growth rates decreased ~10 fold (from ~0.2 to 0.02 day⁻¹) as salinity decreased from the optimum to levels found in Texas lakes (Baker *et al.*, 2007, 2009). Baker *et al.* (Baker *et al.*, 2007, 2009) also suggested that small variations in salinity at low levels determine whether reproductive growth is possible.

Here, we further investigate the role of inflow and salinity as they influence the occurrence of *P. parvum* blooms. We focus on three Texas lakes located along the Brazos River, where observations of blooms have occurred during winter months since late 2000 early 2001. Quantitative sampling commenced in 2002 and 2003, and we include data through 2009.

Study region

The Brazos River flows southeast across Texas (USA), spanning a rain gradient from the arid western regions of the state (averaging ~13.26 cm year⁻¹) to the moister eastern region, with an average of ~155 cm year⁻¹ (Fig. 1). This study focused on the three upper most large reservoirs of the Brazos River; Lakes Possum Kingdom (centered at 32.87°N, 98.50°W, construction completed in 1941), Granbury (32.40°N, 97.76°W, 1969) and Whitney (32.00°N, 97.43°W, 1951) (Fig. 2).

All three lakes are located in the watershed region receiving ~90 cm year⁻¹ of rainfall. Lakes Possum Kingdom and Granbury are sinuous with shorelines that follow the submerged river channel, but the lakes differ in their morphometry and catchment area (see [Handbook of Texas Online](#), 2010). Lake Possum Kingdom has the largest volume of the three lakes, with a capacity of 893×10^6 m³. It has a surface area of 80 km², average depth of ~11 m and a 36 337 km² drainage area. Lake Granbury has the smallest volume of the three, with a capacity of 188×10^6 m³. It receives inflows from Lake Possum Kingdom and runoff from the increased catchment area. Its surface area, average depth and total drainage area are 34 km², ~5 m and 41 732 km². The capacity, area and average depth of Lake Whitney are 467×10^6 m³, 95 km² and ~5 m, respectively. Lake Whitney receives inflows from Lake Granbury and the increased catchment area (45 644 km² total). Further characterizations of these lakes can be found in Roelke *et al.* (Roelke *et al.*, 2007a, 2010a) and Schwierzke *et al.* (Schwierzke *et al.*, 2010).

METHOD

This study focused on the role of river inflow and in lake salinity as they relate to *P. parvum* population density. A bloom was defined as being when *P. parvum* population density exceeded 10×10^6 cells L⁻¹, a level above which toxicity and fish kills are frequently observed. Data were compiled from monitoring activities of Texas A&M University, Brazos River Authority and Texas Parks and Wildlife Department. Locations of sampling stations were system wide and encompassed shore based and open lake locations for each lake (Fig. 2). Sampling frequency was generally weekly to bi weekly during the late fall through early spring (the time of year when *P. parvum* blooms develop and terminate), and monthly to quarterly for the remaining period. Quantitative sampling commenced in Lake Possum Kingdom during 2002 and began in 2003 for Lakes Granbury and Whitney. Prior to this, *P. parvum* population densities were not quantified. Data from 1556 sampling events were compiled from all three lakes, i.e. 371 events in Lake Possum Kingdom, 878 in Lake Granbury and 307 in Lake Whitney.

Estimations of *P. parvum* population density in surface waters were achieved using either a settling technique or a hemacytometer, with personnel from all institutes performing the counts. For the settling technique (Utermöhl, 1958), in most cases, a 100 mL phytoplankton sample was collected from each station at ~0.5 m depth and preserved using glutaraldehyde, 5% v/v and

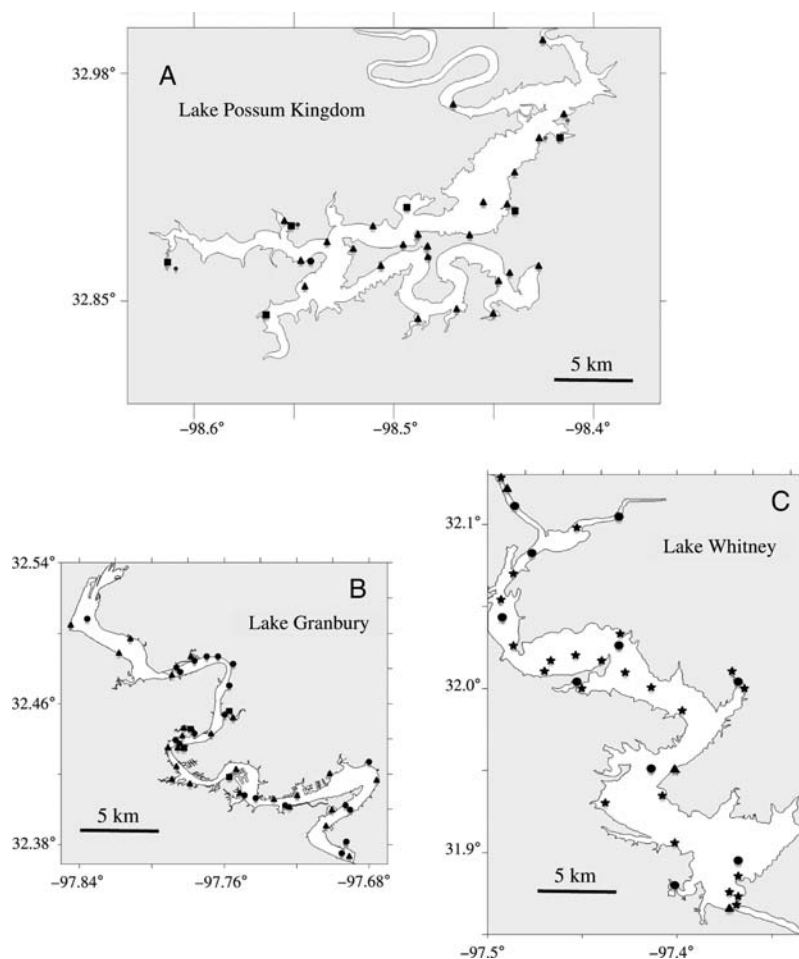


Fig. 2. Maps of Lakes Possum Kingdom (A), Granbury (B) and Whitney (C) showing the location of sampling stations. Circles (●) represent stations that were sampled monthly for periods spanning multiple years by Texas A&M University, stars (★) represent stations that were sampled weekly during periods of bloom and monthly otherwise for a period spanning two years (Texas Parks and Wildlife Department) and squares (■) and triangles (▲) represent stations that were sampled monthly or quarterly over periods spanning several years by Brazos River Authority and Texas Parks and Wildlife Department.

then a 1 mL subsample was settled for 24 h. Randomly selected fields of view were then counted until >200 *P. parvum* cells were enumerated (20 to 40 fields of view). Sample stations designated with a “circle” and “star” on Fig. 2 were enumerated following settling techniques. For the less sensitive hemacytometer technique, live samples were analyzed repeatedly until counting thresholds of 0.37×10^6 cells L^{-1} (“triangle”) and 2×10^6 cells L^{-1} (“square”) were attained.

Daily discharges from the Brazos River were measured at the following upstream locations: South Bend, USGS Station Number 08088000 (Lake Possum Kingdom); Dennis, USGS Station Number 08090800 (Lake Granbury) and Glen Rose, USGS Station Number 08091000 (Lake Whitney). Salinities were measured during sampling using water quality multiprobes (Quanta, Hydrolab) and refractometers.

Simple correlations using linear, exponential and power fit functions (Kaleidagraph, v.4.03), and multiple regression analysis (Matlab, v.7.5.0.338) were performed between *P. parvum* population density, inflow and salinity. We used correlation analyses to estimate the percent variability in *P. parvum* population density explained by either inflow or salinity (based on R^2), and the multiple regression analysis enabled us to simultaneously compare the relative roles of inflow and salinity as they affect *P. parvum* population density (based on the weighting coefficients). For inflows, we used 7 day, 10 day, 30 day and 365 day cumulative inflow prior to each sampling date. The 7 day cumulative inflows showed the best relationships and only those results are reported here.

To better relate inflow magnitudes to the specific growth rate of *P. parvum*, we estimated daily system

flushing rates during the time of peak flows. For this purpose, system flushing rates were estimated by dividing the daily inflow from the Brazos River by the lake volume.

RESULTS

After the 1985 Pecos River event (James and De La Cruz, 1989) when *P. parvum* was first linked to a fish kill in this region, and multiple smaller sized fish kills in the Brazos River area and elsewhere during the following decade (Southard et al., 2010), the first large scale, fish killing *P. parvum* blooms in Texas occurred in multiple systems along the Brazos River during the late fall 2000–early spring 2001. In the Brazos River Basin, the blooms first appeared in Lake Possum Kingdom, then in the state fish hatchery between Lakes Possum Kingdom and Granbury, next in Lake Granbury and eventually reached Lake Whitney. This stretch of the Brazos River is ~120 km. Several fish kills resulted from these *P. parvum* blooms (Southard et al., 2010), but observations of population densities and bloom spread downstream are largely anecdotal.

In the years following the 2000–2001 blooms (when quantitative sampling commenced) until the early spring of 2007, fish killing *P. parvum* blooms were recurrent winter phenomena in all three lake systems, lasting ~2 months (Fig. 3). The timing of these blooms was no longer sequential, as it was during the 2000–2001 period, but instead concurrent. Bloom density maxima increased further down the watershed with maximum bloom densities of $\sim 40\text{--}60 \times 10^6 \text{ cells L}^{-1}$ in Lake Possum Kingdom, $\sim 80\text{--}100 \times 10^6 \text{ cells L}^{-1}$ in Lake Granbury and $\sim 140\text{--}170 \times 10^6 \text{ cells L}^{-1}$ in Lake Whitney. During these events, waters took on a golden color, surface foam was observed and dead fish were seen throughout the affected lakes (Fig. 4). After early spring 2007, recurrent *P. parvum* population maxima still occurred during the late fall through early spring months. Maximum population densities were lower, however, typically reaching $\sim 10 \times 10^6 \text{ cells L}^{-1}$ for Lake Possum Kingdom, $\sim 20\text{--}60 \times 10^6 \text{ cells L}^{-1}$ for Lake Granbury and $\sim 10\text{--}30 \times 10^6 \text{ cells L}^{-1}$ for Lake Whitney. During this period, fish kills were smaller and localized within each lake.

As is typical for this region, rains and associated in stream flows were highest during the early spring through early summer months (Fig. 3). Lake inflows increased in magnitude further down the watershed, presumably because of the increased area of catchment. The spring of 2007 was the wettest period of this data record, with peak inflows attaining $\sim 60 \times$

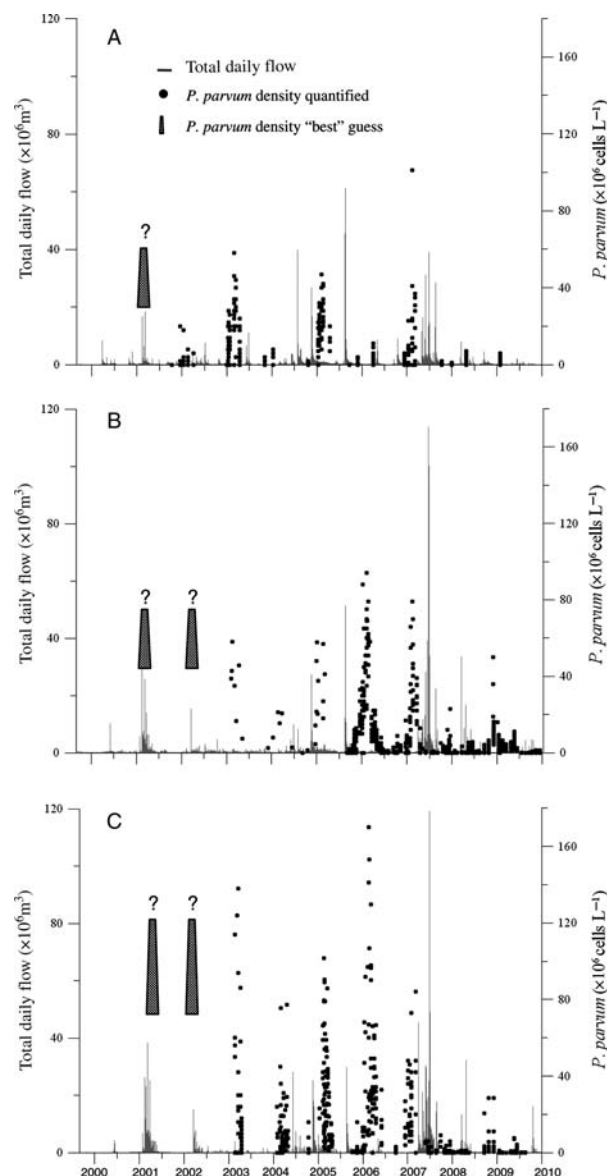


Fig. 3. Recurrent blooms of *Pyramnesium parvum* and daily inflows for a period spanning 2000 through 2009 for Lakes Possum Kingdom (A), Granbury (B) and Whitney (C). During late 2000–early 2001 for Lake Possum Kingdom, and 2001–2002 for Lakes Granbury and Whitney, population densities were approximated from anecdotal information (indicated with a ‘?’). Otherwise, population densities were quantified. Inflow data were obtained from US Geological Survey.

$10^6 \text{ m}^3 \text{ day}^{-1}$ for Lake Possum Kingdom and $\sim 120 \times 10^6 \text{ m}^3 \text{ day}^{-1}$ for Lakes Granbury and Whitney. Whole system flushing rates during peak inflows in the spring of 2007 were 0.08, 0.7 and 0.3 day^{-1} for Lakes Possum Kingdom, Granbury and Whitney. Dry years occurred earlier in the data record where inflows were barely discernable at times. For Lake Possum Kingdom, located highest in the watershed, 2008 and 2009 were also dry



Fig. 4. Features of fish-killing *Prymnesium parvum* blooms. During periods of high *P. parvum* population density waters take on a characteristic golden color (A). Usually when this color is apparent, waters are toxic to fish and large die-offs result (B and C) (photographs courtesy of Brazos River Authority and Texas Parks and Wildlife Department).

years. For Lakes Granbury and Whitney, 2009 was a dry year.

Cumulative inflow for the 7 day period prior to each sampling time showed that higher inflows resulted in lower population densities (Fig. 5). Although more observations of *P. parvum* population density at higher inflows are needed, inflow bloom thresholds (defined as 10×10^6 cells L^{-1}) were apparent, and they varied for each lake, i.e. $\sim 10 \times 10^6 m^3 day^{-1}$ for Lake Possum Kingdom (corresponding to a whole system flushing rate of $0.01 day^{-1}$), $\sim 20 \times 10^6 m^3 day^{-1}$ ($0.12 day^{-1}$) for Lake Granbury and $\sim 40 \times 10^6 m^3 day^{-1}$ ($0.10 day^{-1}$) for Lake Whitney. Inflow to these lakes exceeded thresholds during the spring and early summer months. For Lake Possum Kingdom, this occurred during 8 of the 10 years analyzed. For Lakes Granbury and Whitney, this occurred in 7 and 6 of the years, respectively. While an inflow threshold was observed, above which *P. parvum* populations did not accumulate, monotonic trends were not seen. Linear, power and exponential functions used to correlate 7 day cumulative inflow and *P. parvum* population densities were poor. Using data pooled from all three lakes, models only explained 2%, 1% and 1% of the total variability (equations not shown). Similar findings were obtained when lakes were analyzed separately.

Reports of salinity during the 2000–2001 bloom period were as high as 4 psu in Lake Possum Kingdom (J. Glass, personal communication). Our records for salinity started in 2004 and typically showed annual maxima of $\sim 2–3$ psu for these three lakes prior to the early spring of 2007 (Fig. 6). After the wet season of 2007, annual maxima were typically $\sim 1–2$ psu. There appeared to be a salinity threshold below which *P. parvum* blooms did not occur. At salinities below ~ 1.5 psu for Lake Possum Kingdom and 0.5 psu for Lakes Granbury and Whitney, population densities of *P. parvum* were $< 10 \times 10^6$ cells L^{-1} (Fig. 7). There was one exception in Lake Whitney where *P. parvum* population density exceeded bloom level at low salinity. When data from all three lakes were pooled, linear [equation (1)], power [equation (2)] and exponential functions [equation (3)] used to correlate salinity and *P. parvum* population densities explained 41%, 40% and 34% of the total variability in this data record. Model equations were:

$$[pop] = 12.11[sal] - 4.86 \quad (1)$$

$$[pop] = 1.84[sal]^{2.01} \quad (2)$$

$$[pop] = 0.21e^{1.93[sal]} \quad (3)$$

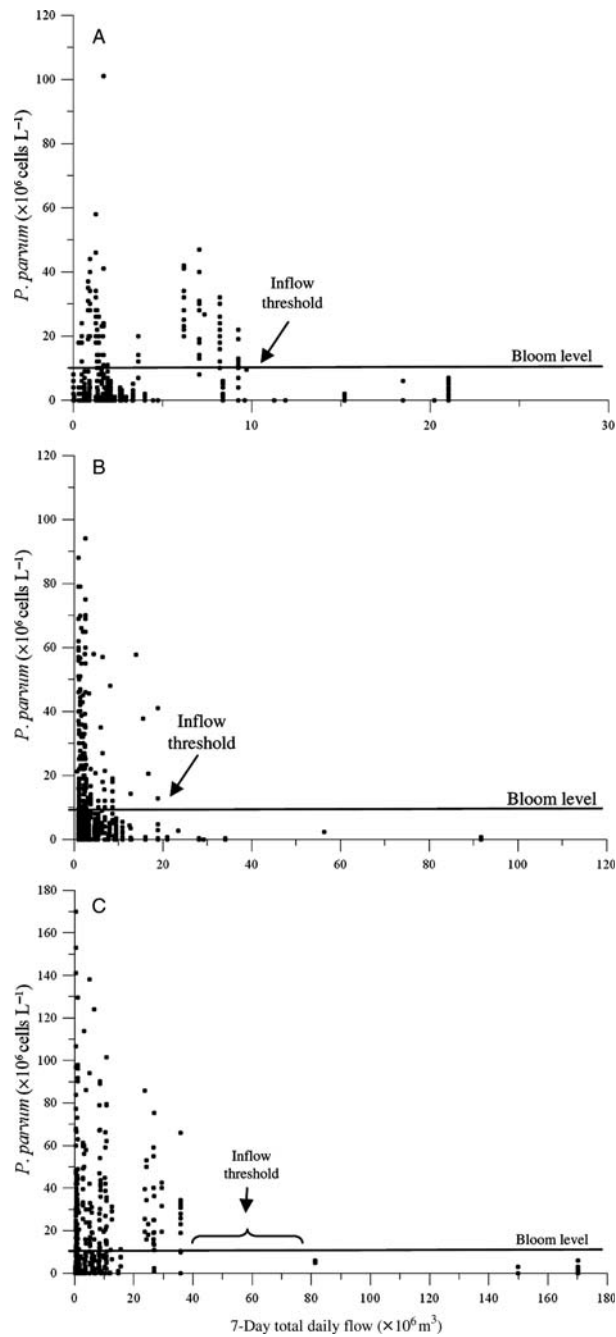


Fig. 5. *Prymnesium parvum* population density plotted against the cumulative inflow over the 7-day period prior to the date of sampling for Lakes Possum Kingdom (A), Granbury (B) and Whitney (C). Population densities greater than 10×10^6 cells L^{-1} , the defined bloom level, occurred when 7-day accumulated inflows were $< 10 \times 10^6 m^3$ for Lake Possum Kingdom, $< 20 \times 10^6 m^3$ for Lake Granbury and conservatively $< 40 \times 10^6 m^3$ for Lake Whitney. These bloom inflow-thresholds corresponded to system flushing rates of 0.01, 0.12 and 0.10 day $^{-1}$.

Similar findings were obtained when lakes were analyzed separately (data not shown). The multiple linear regression [equation (4)] using the 7 day cumulative

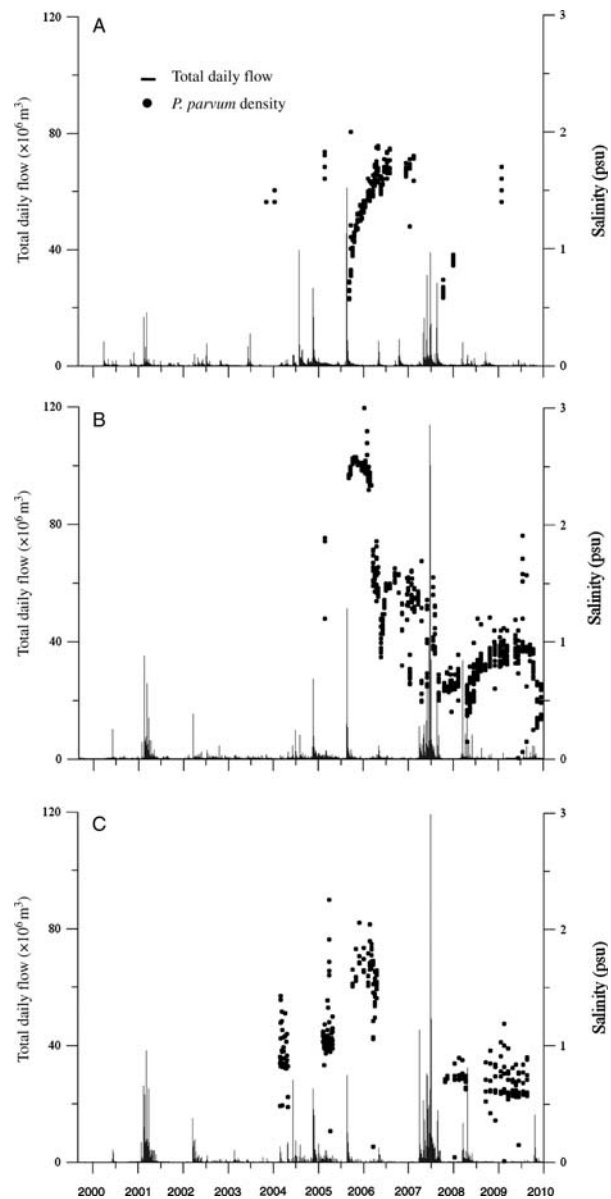


Fig. 6. Salinity and inflows for a period spanning 2000 through 2009 for Lakes Possum Kingdom (A), Granbury (B) and Whitney (C). Prior to the wet spring of 2007, annual salinity maxima typically ranged from 2–3. After this wet period, annual salinity maxima typically ranged between 1–2.

inflow and salinity indicated that salinity more strongly influenced *P. parvum* population density than inflow, where the model was:

$$[\text{pop}] = 0.02[\text{inflow}] + 8.96[\text{sal}] - 3.78 \quad (4)$$

However, this model only explained $\sim 11\%$ of the variance in *P. parvum* population density.

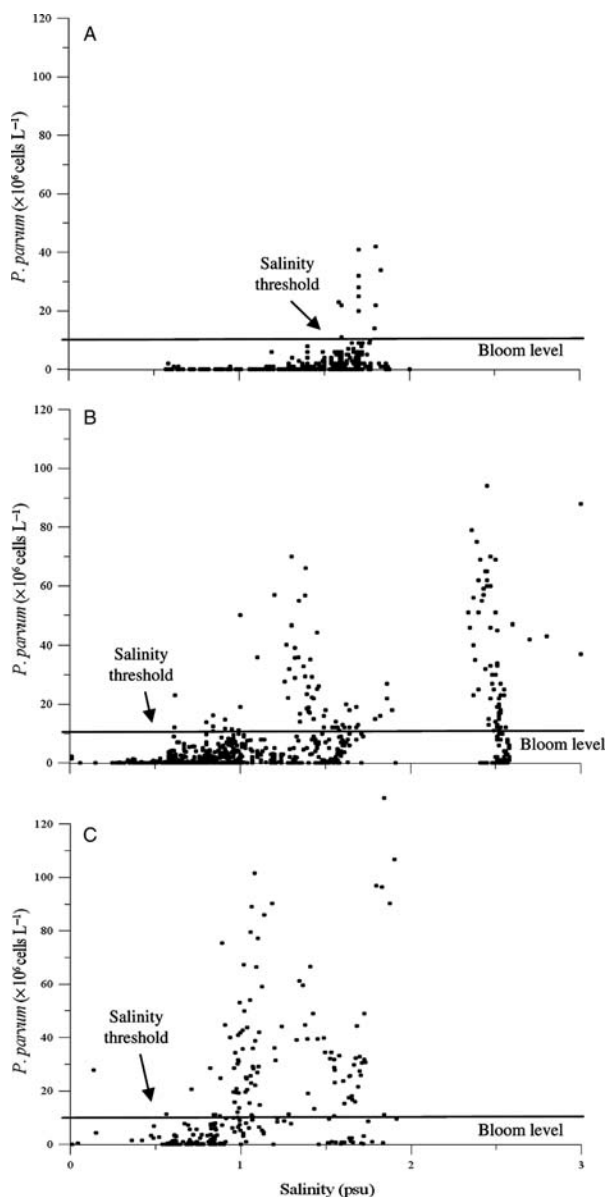


Fig. 7. *Prymnesium parvum* population density plotted against salinity for Lakes Possum Kingdom (**A**), Granbury (**B**) and Whitney (**C**). Population densities greater than 10×10^6 cells L^{-1} , the defined bloom level, occurred when salinities were >1.5 for Lake Possum Kingdom, and >0.5 for Lakes Granbury and Whitney.

DISCUSSION

Prymnesium parvum in Texas appears to be the result of invasion (Lutz Carrillo *et al.*, 2010). Our data suggest that invading *P. parvum* established quickly in lakes downstream from early bloom events. For example, fish killing blooms appeared sequentially down the watershed after they were first noticed in late 2000 early 2001. However, between 2004 and 2007, fish killing blooms were concurrent, suggesting that immigration of

P. parvum from upstream sources was no longer necessary for bloom initiation. The apparent rapid spread of *P. parvum* across the southern USA, and now with fish killing blooms in northern areas (e.g. West Virginia and PA, USA), also suggests that this species is an effective invader.

Paradoxically, our documentation of this invasive species shows that the recurrent blooms occurred under conditions far removed from the growth optimum. Laboratory studies using a Texas strain of *P. parvum* (UTEX LL 2797) showed optimal reproductive growth rates of ~ 0.8 day $^{-1}$ when salinity and temperature were 22 psu and 27°C (Baker *et al.*, 2007, 2009). Using the equation from Baker *et al.* (Baker *et al.*, 2009) and winter temperatures of $\sim 10^\circ\text{C}$, maximum reproductive growth rates were estimated to be ~ 0.1 day $^{-1}$ for the period prior to early spring 2007, when annual salinity maxima ranged from 2 to 3 psu. In other words, blooms occurred when reproductive growth was stressed by low salinity and temperature. In the absence of significant loss factors, such as grazing, these low reproductive growth rates can lead to blooms of high population density, as was demonstrated using a simplified biophysical model depicting *P. parvum* bloom dynamics in Lake Granbury (Roelke *et al.*, 2010a). Production of grazing inhibiting toxins would facilitate this condition, and appears to be the case for *P. parvum*, which produces greater amounts of grazing inhibiting toxin when stressed (Uronen *et al.*, 2005; Granéli and Salomon, 2010).

Prymnesium parvum blooms in these lakes were vulnerable to large inflow events because they occurred during a time of year when maximum reproductive growth rates were low. Thus, it is not surprising that *P. parvum* blooms only developed when inflows were below critical levels. In addition, blooms ceased when inflows exceeded these inflow bloom thresholds during early spring through early summer months. Estimated winter reproductive growth rates during bloom years (~ 0.1 day $^{-1}$) were similar to whole system flushing levels estimated at the inflow thresholds for Lakes Granbury and Whitney, 0.12 and 0.10 day $^{-1}$, respectively. This is consistent with observations from other systems where hydraulic flushing influenced plankton dynamics and the incidence of blooms (Jacoby *et al.*, 2000; Moustaka Gouni *et al.*, 2006; Mitrovic *et al.*, 2008; Roelke *et al.*, 2010a). High inflows were not a requirement for bloom decline, however, as blooms ended with only modest inflows during years 2003, 2005 and 2006.

Inflow bloom thresholds varied between lakes. Most notably, Lake Possum Kingdom required much less inflow to suppress *P. parvum* populations, where the corresponding system flushing rate was 0.01 day $^{-1}$.

Flushing thresholds were an order of magnitude greater for Lakes Granbury and Whitney. Differing thresholds likely stemmed from morphometric variations between systems. For example, Lake Possum Kingdom has a larger volume than Lakes Granbury and Whitney, and is nearly twice as deep. However, it is most likely not well mixed vertically, and flushing events may primarily affect surface waters. Consequently, the inflow required to flush a surface bloom from the system would be lower. Similarly, Lake Possum Kingdom is elongated and sinuous, and likely is not well mixed longitudinally. Inflows needed to flush a smaller water mass would also be lower than those required to flush the system.

Another factor concerning inflow bloom thresholds pertains to cove presence and connectivity. In a lake north of our study area, *P. parvum* population densities were much higher in a disconnected cove compared to those of the open lake (Hambright *et al.*, 2010). Covs might harbor seeding *P. parvum* populations and serve as hydraulic storage zones. Volume exchange rates between storage zones and open waters were shown to influence the magnitude of inflow required to flush blooms from a system (Reynolds, 1990; Grover *et al.*, 2009, *in press*). It is likely that dendritic lakes may require higher inflows to terminate *P. parvum* blooms, though analysis of cove connectivity in these lakes is beyond the scope of the present research.

High inflows need not terminate blooms through hydraulic flushing. For example, toxin production by the Texas strain of *P. parvum* is sensitive to nutrient pulses (Grover *et al.*, 2007; Roelke *et al.*, 2007a; Errera *et al.*, 2008). In Lake Whitney, termination of a bloom was observed coinciding with an inflow event where the lake level rose, but no out flow occurred. The *P. parvum* population declined 52%, where direct dilution accounted for ~30% of this decrease, and toxicity was completely removed (Schwierzke Wade *et al.*, *in review*). Without the advantages imparted to *P. parvum* under stressful conditions (in this case, low nutrient concentrations), this bloom did not re establish. It is likely that increased nutrient loading associated with inflows during 2003, 2005 and 2006 contributed to these bloom declines.

When comparing *P. parvum* population dynamics from the periods before and after the high inflow events of early spring 2007, the incidence of blooms appeared sensitive to small variations in salinity. For example, only when annual salinity maxima reached 2–3 psu did system wide high population density blooms occur. These blooms were accompanied by extensive fish kills (see Southard *et al.*, 2010). When annual salinity maxima ranged from 1 to 2 psu, maximum *P. parvum* population densities were reduced to ~30% of previous levels, and fish kills were small and localized. The

higher maximum reproductive growth rates estimated prior to the early spring of 2007 likely contributed to the higher population densities at that time. Shifts in plankton community dynamics and structures that are sensitively dependent on environmental conditions were previously documented with bloom forming flagellates and other nuisance taxa (Buskey *et al.*, 1998; Roelke *et al.*, 2007b; Shatwell *et al.*, 2008).

Interestingly, salinity bloom thresholds varied between lakes. Blooms occurred in Lake Possum Kingdom only when salinity was >1.5 psu and in Lakes Granbury and Whitney when salinity was >0.5 psu. Inorganic nutrient concentrations were similar between these lakes during the periods of bloom development (Roelke *et al.*, 2007a, 2010a; Schwierzke *et al.*, 2010), so differential nutrient concentrations did not likely affect thresholds. It may be that plankton community sensitivity to salinity varied in these lakes. Due to its higher position in the watershed, the plankton of Lake Possum Kingdom is likely exposed to greater salinity variations naturally. Consequently, the plankton community there may be more tolerant to higher salinities. It may be that less stressed plankton communities are more resistant to *P. parvum* blooms, which in the case of Lake Possum Kingdom, might lead to a greater salinity bloom threshold.

Relationships between *P. parvum* population density, inflow and salinity were not monotonic. Instead, large ranges in *P. parvum* population densities were observed when inflows were lower and salinities were higher. In other words, lower inflows and higher salinities alone did not indicate *P. parvum* population densities would be high. Other factors not accounted for during our study were probably important. These may include competition for resources (Baker *et al.*, 2009), allelopathic effects from chemicals produced by *P. parvum* (Fistarol *et al.*, 2003, 2005; Granéli and Johansson, 2003; Michaloudi *et al.*, 2009), sensitivity of *P. parvum* to chemicals produced by other algae (Grover *et al.*, 2010; Roelke *et al.*, 2010b; James *et al.*, *in review*), use of alternative energy and nutrient sources through mixotrophy and saprophytic nourishment (Nygaard and Tobiesen, 1993; Skovgaard and Hansen, 2003; Lindehoff *et al.*, 2009), grazing inhibition (Granéli and Johansson, 2003; Tillmann, 2003; Michaloudi *et al.*, 2009; Brooks *et al.*, 2010) and grazing by toxin resistant taxa and infection by virus (Schwierzke *et al.*, 2010). All of these processes influence *P. parvum* population dynamics to varying degrees and are not solely a function of inflow and salinity. So, it is not surprising that complex patterns and high variability in *P. parvum* population density were observed over the ranges of inflow and salinity recorded in this study.

In summary, *P. parvum* blooms (and annual population maxima for the period after early spring 2007) were

recurrent winter phenomena in this area of the south central USA. Bloom initiation and development only occurred at a time of year when inflows were low, and large fish killing blooms occurred only when salinity was higher. Bloom termination followed high inflow events, likely through direct flushing of cells and indirect physiological effects. This linkage between incidence of *P. parvum* blooms, inflows and salinity raises concern because sequestration of water continues to increase in this area with rising human population. Combined with variations in precipitation and evaporation predicted from climate change, flows in this area may decrease by 60% (Cai and McCarl, 2009). Though not the focus of climate change models, it is likely that increased evaporation rates associated with regional warming will also result in higher salinity. Consequently, both human population increase and climate change may lead to an increased incidence of *P. parvum* blooms.

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REFERENCES

- Anderson, D. M. and Stolzenbach, K. D. (1985) Selective retention of two dinoflagellates in a well-mixed estuarine embayment: the importance of diel vertical migration and surface water avoidance. *Mar. Ecol. Prog. Ser.*, **25**, 39–50.
- Baker, J. W., Grover, J. P., Brooks, B. W. *et al.* (2007) Growth and toxicity of *Prymnesium parvum* (Haptophyta) as a function of salinity, light and temperature. *J. Phycol.*, **43**, 219–227.
- Baker, J. W., Grover, J. P., Ramachandran, R. *et al.* (2009) Growth at the edge of the niche: an experimental study of the harmful alga *Prymnesium parvum*. *Limnol. Oceanogr.*, **54**, 1679–1687.
- Barreiro, A., Guisande, C., Maneiro, I. *et al.* (2005) Relative importance of the different negative effects of the toxic haptophyte *Prymnesium parvum* on *Rhodomonas salina* and *Brachionus plicatilis*. *Aquat. Microb. Ecol.*, **38**, 259–267.
- Brooks, B. W., James, S. V., Valenti, T. W. Jr *et al.* (2010) Comparative toxicity of *Prymnesium parvum* in inland waters. *J. Am. Water Res. Assoc.*, **46**, 45–62.
- Buskey, E. J., Wysor, B. and Hyatt, C. (1998) The role of hypersalinity in the persistence of the Texas ‘brown tide’ bloom in the Laguna Madre. *J. Plankton Res.*, **20**, 1553–1565.
- Buyukates, Y. and Roelke, D. L. (2005) Influence of pulsed inflows and nutrient loading on zooplankton and phytoplankton community structure and biomass in microcosm experiments using estuarine assemblages. *Hydrobiology*, **548**, 233–249.
- Cai, Y. and McCarl, B. A. (2009) Climate change and Texas water planning: an economic analysis of inter-basin water transfers. Agricultural & Applied Economics Association Annual Meeting, 26–29 July, Milwaukee, Wisconsin.
- Errera, R. M., Roelke, D. L., Kiesling, R. *et al.* (2008) The effect of imbalanced nutrients and immigration on *Prymnesium parvum* community dominance and toxicity: results from in-lake microcosm experiments, Texas, US. *Aquat. Microb. Ecol.*, **52**, 33–44.
- Fistarol, G. O., Legrand, C. and Granéli, E. (2003) Allelopathic effect of *Prymnesium parvum* on a natural plankton community. *Mar. Ecol. Prog. Ser.*, **255**, 115–125.
- Fistarol, G. O., Legrand, C. and Granéli, E. (2005) Allelopathic effect on a nutrient-limited phytoplankton species. *Aquat. Microb. Ecol.*, **41**, 153–161.
- Granéli, E. and Johansson, N. (2003) Effects of the toxic haptophyte *Prymnesium parvum* on the survival and feeding of a ciliate: the influence of different nutrient conditions. *Mar. Ecol. Prog. Ser.*, **254**, 49–56.
- Granéli, E. and Salomon, P. S. (2010) Factors influencing allelopathy and toxicity in *Prymnesium parvum*. *J. Am. Water Res. Assoc.*, **46**, 108–120.
- Grover, J. P., Baker, J. W., Ureña-Boeck, F. *et al.* (2007) Laboratory tests of ammonium and barley straw extract as agents to suppress abundance of the harmful alga *Prymnesium parvum* and its toxicity to fish. *Water Res.*, **41**, 2503–2512.
- Grover, J. P., Hsu, S.-B. and Wang, B. (2009) Competition and coexistence in flowing habitats with a hydraulic storage zone. *Math. Biosci.*, **222**, 42–52.
- Grover, J. P., Baker, J. W., Roelke, D. L. *et al.* (2010) Mathematical models of population dynamics of *Prymnesium parvum* in inland waters. *J. Am. Water Res. Assoc.*, **46**, 92–107.
- Grover, J. P., Crane, K. W., Baker, J. W. *et al.* (2010) Spatial variation of harmful algae and their toxins in flowing-water habitats: a theoretical exploration. *J. Plankton Res.* (in press).
- Guo, M., Harrison, P. J. and Taylor, F. J. R. (1996) Fish kills related to *Prymnesium parvum* N. Carter (Haptophyta) in the Peoples Republic of China. *J. Appl. Phycol.*, **8**, 111–117.
- Hambright, K. D., Zamor, R. M., Easton, J. D. *et al.* (2010) Temporal and spatial variability of an invasive toxigenic protist in a North American subtropical reservoir. *Harmful Algae*. doi:10.1016/j.hal.2010.04.006.
- Handbook of Texas Online s.v. <http://www.tshaonline.org/handbook/online/> (accessed 28 January 2010). Compiling data from: C.L. Dowell, Dams and Reservoirs in Texas: History and Descriptive Information (Texas Water Commission Bulletin 6408 [Austin, 1964]); Texas Water Development Board, Texas Water Development Board and Water for Texans (Austin, 1974); Carlton Bailes and Danny L. Hudson, A Guide to Texas Lakes, Including the Brazos, Colorado, Frio and Guadalupe Rivers (Pacesetter Press, Houston, 1982); and Hill County Historical

- Commission, A History of Hill County, Texas, 1853–1980 (Texian, Waco, 1980).
- Jacoby, J. M., Collier, D. C., Welch, E. B. *et al.* (2000) Environmental factors associated with a toxic bloom of *Microcystis aeruginosa*. *Can. J. Fish. Aquat. Sci.*, **57**, 231–240.
- James, T. L. and De La Cruz, A. (1989) *Prymnesium parvum* Carter (Chrysophyceae) as a suspect of mass mortalities of fish and shellfish communities in western Texas. *Texas J. Sci.*, **41**, 429–430.
- James, S. V., Valenti, T. W., Roelke, D. L. *et al.* Probabilistic ecological assessment of microcystin-LR: a case study of allelopathy to *Prymnesium parvum*. *J. Plankton Res.* (in review).
- Kaartvedt, S., Johnsen, T. M., Aksnes, D. L. *et al.* (1991) Occurrence of the toxic phytoplankton *Prymnesium parvum* and associated fish mortality in a Norwegian fjord system. *Can. J. Fish. Aquat. Sci.*, **48**, 2316–2323.
- Ketchum, B. H. (1951) The flushing of tidal estuaries. *Sev. Industr. Wastes*, **23**, 198–209.
- Ketchum, B. H. (1954) The relation between circulation and planktonic populations in estuaries. *Ecology*, **35**, 191–200.
- Lindehoff, E., Granéli, E. and Granéli, W. (2009) Effect of tertiary sewage effluent additions on *Prymnesium parvum* cell toxicity and stable isotope ratios. *Harmful Algae*, **8**, 247–253.
- Lundholm, N. and Moestrup, O. (eds) (2006) The biogeography of harmful algae. In Granéli, E. and Turner, J. T. (eds), *Ecology of Harmful Algae*. Springer-Verlag, Berlin, pp. 23–35.
- Lutz-Carrillo, D. J., Southard, G. M. and Fries, L. T. (2010) Global genetic relationships among isolates of golden alga (*Prymnesium parvum*). *J. Am. Water Res. Assoc.*, **46**, 24–32.
- Michaloudi, E., Moustaka-Gouni, M., Gkelis, S. *et al.* (2009) Plankton community structure during an ecosystem disruptive algal bloom of *Prymnesium parvum*. *J. Plankton Res.*, **31**, 301–309.
- Miller, C. J., Roelke, D. L., Davis, S. E. *et al.* (2008) The role of inflow magnitude and frequency on plankton communities from the Guadalupe Estuary, TX, USA: findings from microcosm experiments. *Estuarine Coastal Shelf Sci.*, **80**, 67–73.
- Mitrovic, S. M., Chessman, B. C., Davie, A. *et al.* (2008) Development of blooms of *Cyclotella meneghiniana* and *Nitzschia* spp. (Bacillariophyceae) in a shallow river and estimation of effective suppression flows. *Hydrobiologia*, **596**, 173–185.
- Moustaka-Gouni, M., Vardaka, E., Michaloudi, E. *et al.* (2006) Plankton food web structure in a eutrophic polymictic lake with a history of toxic cyanobacterial blooms. *Limnol. Oceanogr.*, **51**, 715–727.
- Nygaard, K. and Tobiesen, A. (1993) Bacterivory in algae—a survival strategy during nutrient limitation. *Limnol. Oceanogr.*, **39**, 273–279.
- Paerl, H. W. (1988) Nuisance phytoplankton blooms in coastal, estuarine, and inland waters. *Limnol. Oceanogr.*, **33**, 823–847.
- Reynolds, C. S. (1990) Potamoplankton: paradigms, paradoxes and prognoses. In Round, F. E. (ed.), *Algae and Aquatic Environment*. Biopress, Bristol, UK, pp. 285–311.
- Roelke, D. L., Augustine, S. and Buyukates, Y. (2003) Fundamental predictability in multispecies competition: the influence of large disturbance. *Am. Nat.*, **162**, 615–623.
- Roelke, D. L., Errera, R., Kiesling, R. *et al.* (2007a) Effects of nutrient enrichment on *Prymnesium parvum* population dynamics and toxicity: results from field experiments, Lake Possum Kingdom, USA. *Aquat. Microb. Ecol.*, **46**, 125–140.
- Roelke, D. L., Zohary, T., Hambright, K. D. *et al.* (2007b) Alternative states in the phytoplankton of Lake Kinneret, Israel (Sea of Galilee). *Freshwater Biol.*, **52**, 399–411.
- Roelke, D. L., Gable, G. M., Valenti, T. W. Jr *et al.* (2010a) Hydraulic flushing as a *Prymnesium parvum* bloom-terminating mechanism in a subtropical lake. *Harmful Algae*, **9**, 323–332.
- Roelke, D. L., Schwierzke, L., Brooks, B. W. *et al.* (2010b) Factors influencing *Prymnesium parvum* population dynamics during bloom formation: results from in-lake mesocosm experiments. *J. Am. Water Res. Assoc.*, **46**, 76–91.
- Sager, D. R., Barkoh, A., Buzan, D. L. *et al.* (2008) Toxic *Prymnesium parvum*: a potential threat to U.S. Reservoirs. In Allen, M. S., Sammons, S. and Maceina, M. J. (eds), *Balancing Fisheries Management and Water Uses for Impounded River Systems*. American Fisheries Society, Symposium 62, Bethesda, MD, pp. 261–273.
- Seliger, H. H., Carpenter, J. H., Loftus, M. *et al.* (1970) Mechanisms for the accumulation of high concentrations of dinoflagellates in a bioluminescent bay. *Limnol. Oceanogr.*, **15**, 234–245.
- Schwierzke, L., Roelke, D. L., Brooks, B. W. *et al.* (2010) *Prymnesium parvum* population dynamics during bloom development: a role assessment of grazers and virus. *J. Am. Water Res. Assoc.*, **46**, 63–75.
- Schwierzke-Wade, L., Roelke, D. L., Brooks, B. W. *et al.* *Prymnesium parvum* bloom termination role of hydraulic dilution. *J. Plankton Res.* (in review).
- Shatwell, T., Kohler, J. and Nicklisch, A. (2008) Warming promotes cold-adapted phytoplankton in temperate lakes and opens a loop-hole for Oscillatoriales in spring. *Global Change Biol.*, **14**, 2194–2200.
- Skovgaard, A. and Hansen, P. J. (2003) Food uptake in the harmful alga *Prymnesium parvum* mediated by excreted toxins. *Limnol. Oceanogr.*, **48**, 1161–1166.
- Southard, G. M., Fries, L. T. and Barkoh, A. (2010) *Prymnesium parvum*: the Texas experience. *J. Am. Water Res. Assoc.*, **46**, 14–23.
- Suikkanen, S., Fistarol, G. O. and Granéli, E. (2004) Allelopathic effects of the Baltic cyanobacteria *Nodularia spumigena*, *Aphanizomenon flos aquae* and *Anabaena lemmermannii* on algal monocultures. *J. Exp. Mar. Biol. Ecol.*, **308**, 85–101.
- Tillmann, U. (2003) Kill and eat your predator: a winning strategy of the planktonic flagellate *Prymnesium parvum*. *Aquat. Microbial. Ecol.*, **32**, 73–84.
- Tillmann, U., John, U. and Cembella, A. (2007) On the allelochemical potency of the marine dinoflagellate *Alexandrium ostenfeldii* against heterotrophic and autotrophic protists. *J. Plankton Res.*, **29**, 527–543.
- Uronen, P., Lehtinen, S., Legrand, C. *et al.* (2005) Haemolytic activity and allelopathy of the haptophyte *Prymnesium parvum* in nutrient-limited and balanced growth conditions. *Mar. Ecol. Prog. Ser.*, **299**, 137–148.
- Utermöhl, H. (1958) Zur Vervollkommenung der quantitativen phytoplankton methodik. *Mitt. Int. Ver. Theoret. Ang. Limnol.*, **9**, 1–38.

Toxic *Prymnesium parvum*: A Potential Threat to U.S. Reservoirs

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Abstract.—*Prymnesium parvum*, the golden alga, is a toxin-producing, microscopic alga first identified in U.S. inland waters during a 1985 fish kill on the Pecos River, Texas. Golden alga has been reported in 16 states, and toxic blooms have caused substantial fish kills and loss to recreation. Golden alga releases toxins (prymnesins) that affect gill-breathing organisms but do not affect most aquatic insects and higher vertebrates. The toxins complete formation externally with the addition of cations, and water quality variables such as salinity, temperature, pH, and nutrients influence the toxicity of a bloom. Algae control treatments have been developed for ponds and small reservoirs but are usually too costly and labor intensive for practical use on large water bodies. Potential treatments include ammonia compounds, copper compounds, acid applications, potassium permanganate, ozone, ultraviolet light, and nutrient manipulations. The decision to use treatments must balance expected benefits with costs and possible impacts to the aquatic ecosystem. Treatments must meet federal, state, and local rules and regulations and be coordinated with stakeholders. Research is ongoing to determine bloom dynamics and potential management options for large water bodies.

Introduction

Harmful algal blooms have occurred in reservoirs throughout the United States, and several taxa have caused toxic algal blooms resulting in fish kills and water quality problems. One species responsible for such problems is *Prymnesium parvum*, commonly called the golden alga, which was first described in 1937 in England (Carter 1937). *Prymnesium parvum* is widely distributed

being found on every continent except Antarctica, reported from at least 14 countries, and is most often associated with estuarine or marine waters (Shilo and Aschner 1953; Larsen and Bryant 1998) but can exist in slightly brackish inland waters. *Prymnesium parvum* can form cysts when stressed (Green et al. 1982). Toxins released by *P. parvum* are called prymnesins and affect gill-breathing organisms (Yariv and Hestrin 1961; Ulitzer and Shilo 1966; Igarashi et al. 1999); however, most aquatic insects appear unaffected (Shilo 1972), and adverse

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impacts to higher vertebrates have not been documented (Linam et al. 1991).

Prymnesium parvum was found in brackish inland waters in the Middle East and caused fish mortalities in aquaculture facilities (Shilo and Shilo 1953). The alga was identified in the United States in water samples from a 1985 fish kill on the Pecos River, Texas (James and De La Cruz 1989; Linam et al. 1991). Since then, four additional Texas river systems, the Brazos, Canadian, Colorado, and Red, have had golden alga fish kills (Figure 1), and the alga has been reported in 16 states (Figure 2).

Since 2001, *P. parvum* has been a persistent problem in Texas, affecting 33 water bodies and killing more than 30 million fish, and communities associated with affected res-

ervoirs experiencing losses in recreational-based incomes (Oh and Ditton 2005). *Prymnesium parvum* also is problematic in two Texas state fish hatcheries, killing broodfish and production fingerlings. As a result of these problems, Texas Parks and Wildlife Department (TPWD) started developing management options and coordinating research efforts concerning this toxic alga.

Starting in 2005, Arizona experienced *P. parvum*-associated fish kills in numerous Phoenix-area lagoons and three nearby reservoirs. The Arizona Game and Fish Department (AGFD) collaborated with industry, university researchers, TPWD staff, and other agencies to evaluate research and treatment studies. This collaboration resulted in development of

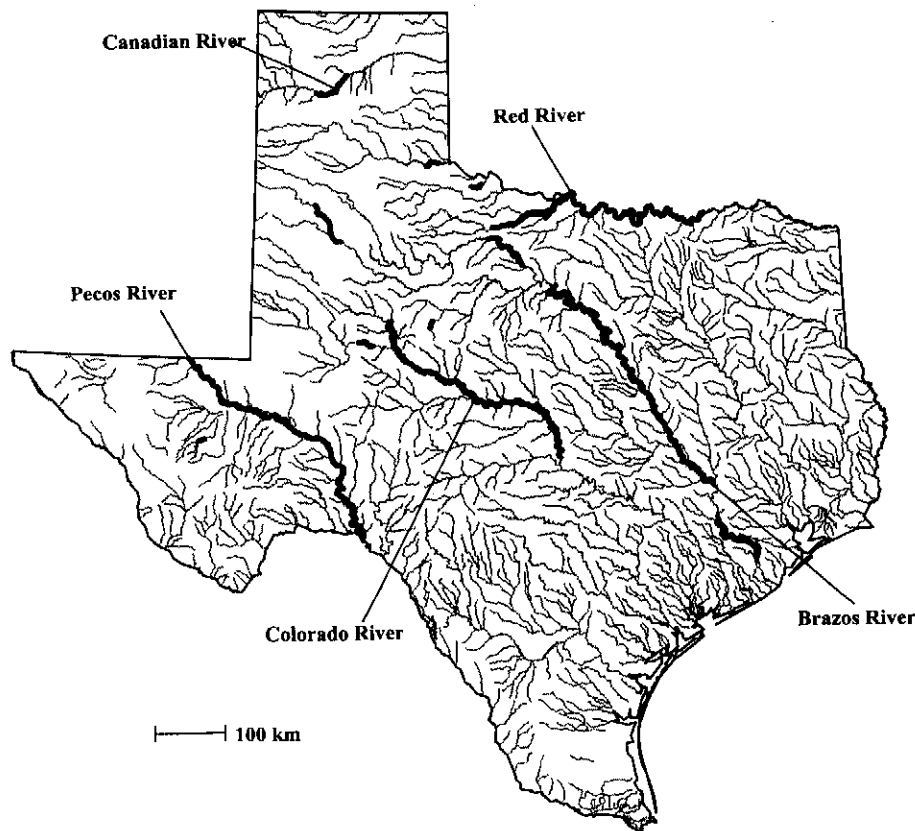
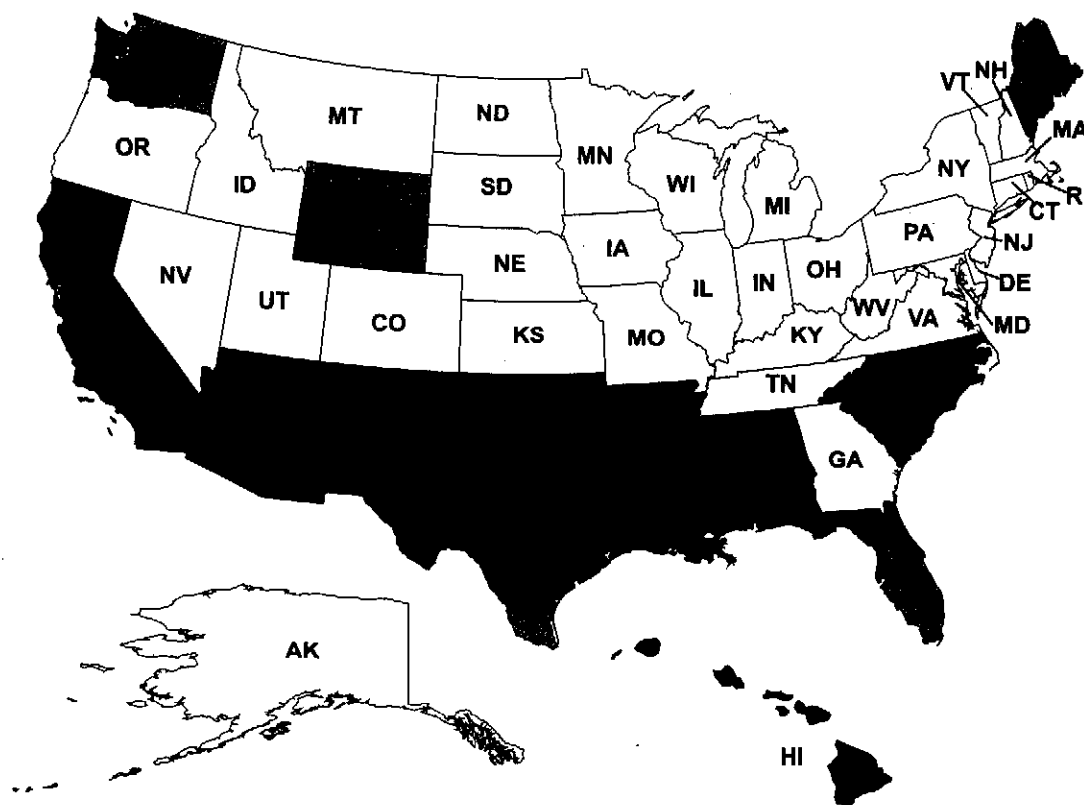


Figure 1. River systems in Texas with areas affected by golden alga fish kills depicted by dark shaded lines.



a treatment and management plan for lagoons and small lakes by AGFD (Swanson 2006).

Prymnesium parvum Blooms

Visual indications of a dominant *P. parvum* bloom include abnormal yellow or gold to rust-colored water and foaming where the water is agitated. Stressed, lethargic, or dead fish may be present, with fish bleeding from the gills and showing reddening or hemorrhaging of the skin, particularly at the fins, opercula,

Microscopic examination of subsurface water samples is required since *P. parvum* is ultraviolet-light inhibited and avoids the water surface (Paster 1973), and magnifications of 400–1,000 \times are required for a presumptive identification. *Prymnesium parvum* (Figure 3) is subspherical to elongate

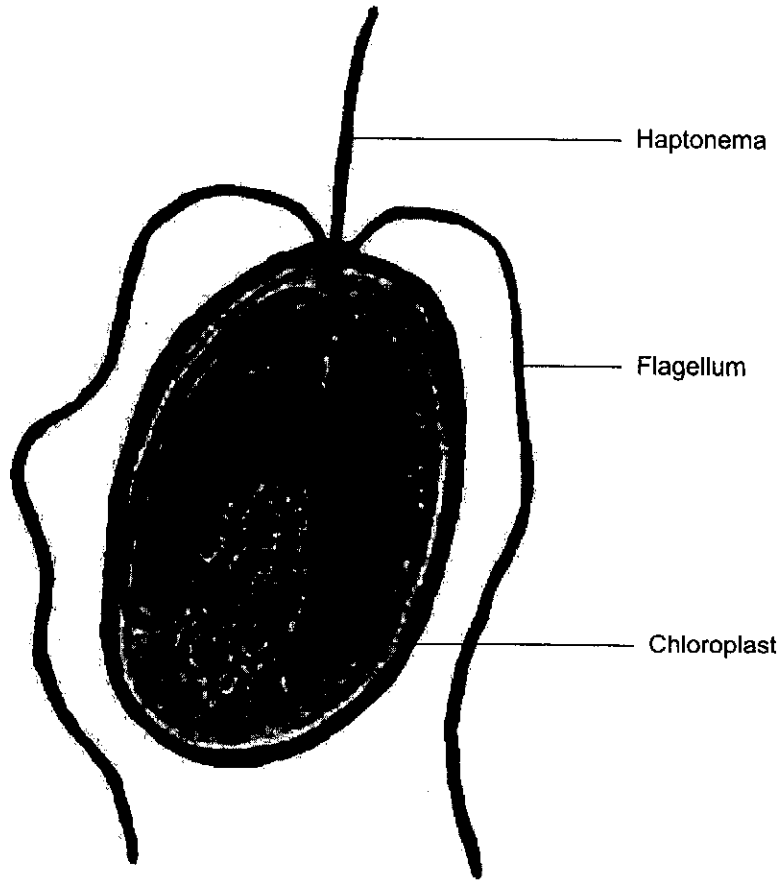


Figure 3. Golden alga cell with identifying characteristics indicated. (Drawing by Robert G. Howells, Texas Parks and Wildlife Department).

and approximately 8–11 μm long with two flagella and a haptonema arising from a pit (Lee 1980; Bold and Wynne 1985; Larsen 1999). The haptonema is flexible but non-coiling and can be used to attach the cell to a surface when the cell is resting. Two large yellow-green chloroplasts are situated laterally and parietally and are often deeply lobed. The alga exhibits a characteristic swimming motion of moving forward while spinning on its longitudinal axis (Green et al. 1982). Corroborative identification by experienced individuals is recommended when first becoming familiar with this organism, while confirmation of visual identifications

requires the use of electron microscopy to examine scale morphology.

When stressed, the alga can form cysts that sink to the bottom sediments (Green et al. 1982). These cysts can be viable for several months and return to the normal cellular form when conditions are appropriate. However, cysts can only be accurately identified as *P. parvum* through electron microscopy examination of the cyst scales.

Factors Affecting Blooms and Toxicity

As with all phytoplankton, *P. parvum* needs a competitive advantage to increase in num-

bers and potentially dominate the algal community. Although the exact factors for *P. parvum* bloom and toxin formation are unknown and likely vary, there are several conditions commonly associated with toxic events. Investigations by TPWD indicate that most *P. parvum* blooms in Texas occur in the central and western areas of the state and begin during fall or early winter. Saline soils, natural brine springs, and oil field brines contribute to a high salt content in these areas of Texas. Lower temperatures associated with fall and winter and higher salt content could provide a competitive advantage for this euryhaline and eurythermal alga (Shilo and Aschner 1953; Larsen and Bryant 1998). Decreased populations of other algae and planktonic predators during winter result in less competition and predation and could contribute to *P. parvum* dominance, while other factors such as photoperiod and nutrient availability may be important but have yet to be determined.

Toxins released by *P. parvum* cells are not fully formed in the cell and must combine with cations in the water to form the final toxic compounds (Yariv and Hestrin 1961; Ulitzer and Shilo 1966; Shilo and Sarig 1989). Thus, water quality conditions greatly influence the toxicity of the final compounds (Shilo and Aschner 1953; McLaughlin 1958; Reich and Parnas 1962; Ulitzer and Shilo 1964; Shilo and Sarig 1989). One factor influencing the availability of cations to complete formation of the toxic compounds is pH (Shilo and Sarig 1989). At high pH levels, more cations are in solution and available than at low pH levels. Low pH levels can inhibit toxin formation. This is illustrated by *P. parvum* being present in many rivers and reservoirs across Texas but fish kills occurring only in central and western Texas. Soils in these western areas of Texas are alkaline and waters have pH greater than 7, while east Texas has acidic soils and lower pH (often below 7) in the associated water bodies

where *P. parvum* can bloom without causing a fish kill.

Research indicates that nutrient concentrations also influence *P. parvum* toxicity (Dafni et al. 1972; Paster 1973; Holdway et al. 1978), with toxicity increasing under nutrient limiting conditions (Larsen et al. 1993; Johansson and Graneli 1999). The alga exhibits mixotrophy (Bold and Wynne 1985; Barreiro et al. 2005) and can acquire nutrients by consuming bacteria and other plankton. The toxin's allelopathic effect may be used to increase capture success by killing or slowing other organisms, and toxicity to fishes may be coincidental.

Due to the complex interactions noted, no correlation has been determined between toxicity, alga density, and toxin concentrations. High toxicity can result at low cell densities, or conversely, high cell counts can occur without toxicity.

Impacts to Aquatic Biota and Recreation

Ecological Impacts

Although a variety of toxic effects have been attributed to prymnesins, the ichthyotoxicity is best known (Shilo 1972; Paster 1973). Prymnesins affect gill-breathing organisms by causing hemorrhaging and interruption of the selective permeability of gills (Yariv and Hestrin 1961; Ulitzer and Shilo 1966; Igarashi et al. 1999). All species of fish, bivalves, crayfish, gilled amphibians (Paster 1973; James and De La Cruz 1989; Linam et al. 1991), and certain zooplankton species (Nejstgaard et al. 1995; Tillmann 2004; Barreiro et al. 2005; Kiesling et al. 2005) are susceptible to prymnesins.

Fish kill investigations in Texas indicate a general progression of fish mortality during a toxic bloom. Commonly, small forage fishes are initially killed, especially planktivorous species such as threadfin shad *Doros-*

ma petenense and gizzard shad *D. cepedianum*. Freshwater drum *Aplodinotus grunniens* are affected relatively early during blooms. The next fish group impacted includes shallow-water fishes such as juvenile and young adult centrarchids, minnows, and cichlids. As the bloom expands and refugia disappear, larger, more mobile fishes, such as *Morone* spp. and ictalurids, succumb. Common carp *Cyprinus carpio*, gar *Lepisosteus* spp., and buffalo *Ictiobus* spp. usually are affected last. This sequence may vary according to the order habitats are affected by changes in water circulation carrying the bloom.

Ecological impacts depend on the duration and severity of the toxic conditions, with impacts ranging from minor reductions in forage fish populations to major declines in fisheries. Forage fishes are rapidly replenished through natural reproduction, while higher trophic species may require considerable stocking effort or years to recover naturally. Reservoirs with repeated fish kills have had their recreational fisheries essentially eliminated, and threatened, endangered, or species of concern may lack sufficient numbers to recover from kills. No risks to terrestrial vertebrate or human health have been documented for *P. parvum* toxins (Linam et al. 1991).

Secondary ecological impacts due to water quality degradation from factors such as dissolved oxygen fluctuations, high bacterial growth, and decaying fishes are possible. Alterations in the ecosystem community structure can result in impacts, including food web shifts such as reduced forage fish species, changes in phytoplankton species abundance, and increased bacterial abundance.

Economic Impacts

Fish kills have adverse effects on recreational economies associated with reservoirs and relate directly to reduced fishing success, poor esthetics, and perceived health concerns. In

a study by Oh and Ditton (2005), *P. parvum* fish kills resulted in a conservative estimate exceeding \$3 million U.S. dollars lost to the local economy around Possum Kingdom Reservoir. The study documented a significant reduction in visitation and concession sales at Possum Kingdom Lake State Park, which reflected losses from both decreased fishing and general use. The estimated economic loss did not include the value of the fishes killed, restocking costs, or relocation of fishing guides to other reservoirs.

Treatment and Management Options

Treatments for Hatcheries and Small Impoundments

Treatments to control *P. parvum* were first developed in Israel in aquaculture ponds using ammonia or ammonium sulfate to lyse cells (Shilo and Shilo 1953; Shilo and Sarig 1989). In laboratory tests, Shilo and Aschner (1953) mitigated prymnesin toxicity using substances such as oxidants, adsorbents, bacteria, and antibiotics. McLaughlin (1958) suggested a treatment by reducing pH to 6.0–6.5 to decrease toxicity. Reichenbach-Klinke (1973) found copper sulfate, a wide spectrum algacide, to be effective, and Guo et al. (1996) recommended manure additions to prevent *P. parvum* dominance in fish culture ponds. Reducing salinity in brackish water ponds has been used to control *P. parvum* blooms (Guo et al. 1996).

To successfully rear sport fishes at affected hatcheries, TPWD has used, modified, and examined a variety of treatments (Barkoh and Fries 2005). Copper-based algacides are effective at temperatures below 15°C but are nonselective towards phytoplankton communities. These algacides may negatively affect important food sources and sensitive fish species. Impacts on other algae that are competitors to the golden alga need to be considered before using any

wide-spectrum algaecide. Reducing these algal populations may actually give the golden alga a greater competitive edge to rebloom before the other algal species can recover. Ammonium sulfate additions increase un-ionized ammonia nitrogen (UIA-N), which causes osmotic imbalance leading to lysis of *P. parvum* cells (Shilo and Shilo 1962). The un-ionized fraction of total ammonia is positively correlated to temperature and pH, and treatments are not successful at temperatures below 15°C or pH below 7.0 (Barkoh and Fries 2005).

Texas freshwater hatcheries control *P. parvum* with a minimum concentration of UIA-N near 0.16 mg/L. This UIA-N concentration may have adverse effects on early life stages of fishes and sensitive fish species (Barkoh et al. 2003). Concentrations of UIA-N greater than 0.25 mg/L appear to have substantial negative effects on striped bass *Morone saxatilis* production. Monitoring pond pH, temperature, and ammonia concentrations is required to maintain UIA-N concentrations between these upper and lower thresholds. Two UIA-N treatment strategies are currently under evaluation at TPWD hatcheries. One strategy monitors cell densities and applies ammonium sulfate when *P. parvum* cells are found, while the other strategy maintains a minimum of 0.16 mg/L UIA-N at all times.

Concentrations of potassium permanganate near the potassium permanganate demand (Tucker 1989) may temporarily reduce acute toxicity due to *P. parvum* (Smith 2005a), and ≥ 2 mg/L above the demand may control cell density (Dorzab and Barkoh 2005; Smith 2005b). Hydrogen peroxide lyses *P. parvum* cells in 24 h at 62.5–500 mg/L, in 1 h at 3,125 mg/L, and in 15 min at 12,500 mg/L (Southard 2005). Higher concentrations can be used to disinfect equipment but may be harmful to some fishes (Rach et al. 1997). Additional studies on oxidizing com-

pounds, especially those labeled as algaecides, are planned by TPWD.

In laboratory experiments, acid applications reduced pH, toxicity and density of viable *P. parvum* cells, but pH returned to pre-treatment levels within 18–28 h (Southard and Klein 2005). Ultrasonic vibrations (Dorzab 2005), barley straw, and probiotics (e.g., bacteria inoculants) were studied but were not successful for control of *P. parvum* blooms and toxicity (Barkoh et al. 2008). For small water volumes, as in recirculating incubation systems and fish hauling units, TPWD has used ultraviolet light and ozone treatments to destroy cells and reduce toxicity. Ozone at 5 mg/L for 15 min is used to treat egg incubation and hatching system water at TPWD fish hatcheries. These treatments may not be practical for large water volumes.

Studies indicate that prymnesin toxicity may be related to nutrient limitation (Holdway et al. 1978; Kaartvedt et al. 1991; Aure and Rey 1992; Lindholm et al. 1999), and TPWD research suggests that nitrogen and phosphorus applications may control *P. parvum* cells and toxicity (Kurten et al. 2007). While nutrient enhancement shows promise, higher pH may result and must be addressed to make this a viable control option for areas with sensitive species. Nutrient manipulations may encourage bloom formation by other harmful algae such as blue-green species, so the nutrient ratios and algae must be carefully monitored.

When *P. parvum* was found in Arizona, the AGFD worked with universities and industry to examine treatment alternatives. A workshop held in 2005 led to the development of early detection and rapid-response guidelines for toxic blooms (Swanson 2006). The Arizona guidelines include algal control using copper-based algaecides (e.g., Cutrine Plus and Earth Tec) in intensively stocked and managed Urban Fishing Program (UFP) or private lagoons up to 20 ha.

The Arizona guidelines (Swanson 2006), the Texas hatchery management document (Barkoh and Fries 2005), and the Texas guidelines (Sager et al. 2007) provide an overview and possible treatment discussion for ponds and small impoundments. However, local regulations, water body-controlling authorities, chemical-use restrictions, lake-management objectives, and other issues must be considered prior to deciding upon a treatment option. These factors can require balancing competing needs or desires. Although several successful treatments have been found, these require monitoring for the presence and change in *P. parvum* populations, treatment levels, and the need for repeated treatment applications. Further, treatments may have undesirable side effects and may not be cost-effective for large water bodies. The need to balance the threat of the *P. parvum* with potential treatment problems should be addressed on a case-by-case basis prior to implementing these controls.

Treatments for Large Reservoirs and Lakes

Some research conducted or sponsored by TPWD was aimed at evaluating treatments for potential use in reservoirs. Clays and clay/flocculant combinations, which have been used against harmful algal blooms in marine environments, were evaluated for their efficacy against *P. parvum* (Sengco and Anderson 2005). While the six clays tested did not effectively remove *P. parvum* cells, removal was enhanced through adding flocculants with the clays. However, fish bioassay results were ambiguous, and whether the treatments reduced toxicity to fish species was undetermined. Additional research is required to demonstrate the feasibility of clay and clay/flocculant combinations. Barley straw and its extracts reportedly provide algal control without deleterious environmental effects (Gibson et al. 1990; Welch et

al. 1990; Newman and Barrett 1993; Lynch 2002). However, TPWD-sponsored experiments failed to demonstrate efficacy of barley straw and its extracts against *P. parvum* (Kiesling et al. 2005; Barkoh et al. 2008).

Developing Management Options

To develop management options in Texas, TPWD initiated meetings to determine critical information gaps and, in October 2003, hosted an international workshop with experts invited from the United States and Europe to review the state of knowledge on *P. parvum* and discuss information needs (Singhurst and Sager 2004). Consequently, research was initiated to test treatment options, gain knowledge of bloom and toxin production dynamics, determine the alga's distribution in Texas, obtain genetic information, and conduct economic studies to determine impacts to affected recreational economies (Table 1). Overviews of this research and preliminary results are available through the TPWD Web site (www.tpwd.state.tx.us and search for golden alga).

To implement management plans in Texas, numerous stakeholders must be considered. Several agencies have responsibilities for problems associated with toxic *P. parvum* blooms in Texas waters. As the state fish and wildlife agency, TPWD is concerned with effects to aquatic ecosystems and recreational use. The Texas Commission on Environmental Quality, an environmental regulatory agency, is concerned with water quality and water-use issues related to the blooms. River authorities manage water-use activities and are concerned with how toxic blooms affect their operations and customers. Additionally, many local municipalities and businesses are affected by toxic blooms. This mix of state and local entities with vested interests in the affected aquatic systems dictates that management and control efforts aimed at *P. parvum* be well coordinated. When viable

Table 1. Research studies on the toxic golden alga undertaken or funded by the Texas Parks and Wildlife Department (TPWD; 2004–2007). More detailed information is available through the TPWD Web site (www.tpwd.state.tx.us).

Research topic	Research group ^a
Pond treatment options testing (copper, ammonia, ultrasonics, ultraviolet light, ozone, potassium peroxide, microorganisms, etc.)	Numberous TPWD researchers, including Aaron Barkoh, Gerald Kurten, Loraine Fries, Greg Southard, David Klein, Dennis Smith, Tom Dorzab, Dale Lyon, Jake Isaac, and John Paret
Barley straw treatment testing	Aaron Barkoh, John Paret, Drew Begley, Dale Lyon, Dennis Smith, J. Warren Schlechte, TPWD (Barley Straw); and Daniel Roelke, TAMU-College Station; James Grover, UT-Arlington; Richard Kiesling, USGS; and Bryan Brooks, Baylor University (Barley Straw Extract)
Lake Whitney golden alga bloom monitoring	David Buzan, Meridith Byrd, and Janet Nelson, TPWD
Statewide survey (distribution determination)	Loraine Fries and Greg Southard, TPWD
Removal from water column through clay and/or clay + flocculant application	Mario Sengco and John Anderson, Woods Hole Oceanographic Institute
Bloom and toxin production dynamics	Daniel Roelke, TAMU-College Station; James Grover, UT-Arlington; Richard Kiesling, U.S. Geological Survey; and Bryan Brooks, Baylor University
Impacts to regional recreational economy from 2001 Possum Kingdom Reservoir bloom and fish kill	Chi-Ok Oh and Robert Ditton, TAMU-College Station
Genetics (strain determination, qPCR [Quantitative polymerase chain reaction] development, etc.)	John La Claire, III, UT-Austin
Lake Whitney water circulation during blooms	Ayal Anis, TAMU-Galveston

^a Abbreviations:

TAMU: Texas A&M University

TPWD: Texas Parks and Wildlife Department

UT: University of Texas

USGS: United States Geological Survey

treatment options are identified, TPWD will work with the other agencies and stakeholders to develop management plans and options. Guidelines were developed by TPWD to assist preparing plans and managing *P.*

parvum blooms in Texas ponds and small reservoirs (Sager et al. 2007).

The treatment options developed for TPWD hatchery ponds (Barkoh and Fries 2005) may be applicable to small impound-

ments or partial treatments of large water bodies. Partial treatment of large water bodies may be practical to interrupt bloom initiation, control a bloom isolated to a smaller part of a larger water body, or perhaps establish refugia. Management options may vary based upon local conditions and could range from control of nutrient inputs to application of algaecides (Sager et al. 2007). Treatments likely will be implemented by local authorities due to the need for rapid response and the fact that local entities actually oversee the affected water bodies.

Since the majority of affected water bodies in Arizona are intensively managed urban impoundments, the AGFD developed a more aggressive approach to control *P. parvum*. In 2005, the AGFD held a workshop with experts from government, industry, and academia to discuss the problems and potential control strategies. From this workshop and *P. parvum* research and management results, AGFD prepared guidelines for management options for *P. parvum* in urban impoundments (Swanson 2006). These guidelines include information to minimize the risk of spread of algae, investigate and monitor toxic algal blooms, and control algae in UFP waters using copper-based algaecides, which are administered by professional lake consultants or park staffs. A monitoring program was implemented for the 20 UFP waters and several large impoundments on the Salt River with a history of algae problems (i.e., Saguaro, Canyon, and Apache reservoirs). The guidelines include communication and outreach strategies to keep the public informed. The AGFD will coordinate and monitor ongoing efforts for the state and revise guidelines as appropriate.

This paper covered activities undertaken in two of the affected U.S. states. We believe these collective experiences and knowledge gained may be helpful to any entity trying to develop management options for this harm-

ful alga. While there are options to control *P. parvum* blooms in aquaculture ponds and small reservoirs, these treatments are not generally practical in large water bodies. Continued research may eventually identify control mechanisms for large water bodies affected by *P. parvum* by addressing the many questions and issues yet to be resolved.

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References

- Aure, J., and F. Rey. 1992. Oceanographic conditions in the Sandsfjord system, western Norway, after a bloom of the toxic prymnesiophyte *Prymnesium parvum* Carter in August 1990. *Sarsia* 76:247–254.
- Barkoh, A., and L. Fries, editors 2005. Management of *Prymnesium parvum* at Texas state fish hatcheries. Texas Parks and Wildlife Department, Management Data Series 236, PWD RP T3200–1188 (9/05), Austin.
- Barkoh, A., J. M. Paret, D. C. Begley, D. D. Lyon, D. G. Smith, and J. W. Schlechte. 2008. Evaluation of barley straw and a commercial probiotic for controlling *Prymnesium parvum* in fish production ponds. *North American Journal of Aquaculture* 70:80–91.
- Barkoh, A., D. G. Smith, and J. W. Schlechte. 2003. An effective minimum concentration of unionized ammonia nitrogen for controlling *Prymnesium parvum*. *North American Journal of Aquaculture* 65:220–225.
- Barreiro, A., C. Guisande, I. Maneiro, T. Lien, C. Legrand, T. Tamminen, S. Lehtinen, P. Uronen, and E. Graneli. 2005. Relative importance of the different negative effects of

- the toxic haptophyte *Prymnesium parvum* on *Rhodomonas salina* and *Brachionus plicatilis*. *Aquatic Microbial Ecology* 38:259–267.
- Bold, H., and M. Wynne. 1985. Class Prymnesiophyceae. Pages 417–428 in H. Bold and M. Wynne. *Introduction to the algae*, 2nd edition. Prentice-Hall, Englewood Cliffs, New Jersey.
- Carter, N. 1937. New or interesting algae from brackish water. *Archiv fur Protistenkunde* 90:1–68.
- Dafni, Z., S. Ulitzer, and M. Shilo. 1972. Influence of light and phosphate on toxin production and growth of *Prymnesium parvum*. *Journal of General Microbiology* 70:199–207.
- Dorzab, T. 2005. Evaluation of an ultrasonic device to control golden alga *Prymnesium parvum* in fish hatchery ponds. Pages 71–73 in A. Barkoh, and L. T. Fries, editors. *Management of Prymnesium parvum at Texas state fish hatcheries*. Texas Parks and Wildlife Department, Management Data Series 236, PWD RP T3200–1138 (9/05), Austin.
- Dorzab, T., and A. Barkoh. 2005. Toxicity of copper sulfate and potassium permanganate to rainbow trout and golden alga *Prymnesium parvum*. Pages 20–24 in A. Barkoh, and L. T. Fries, editors. *Management of Prymnesium parvum at Texas state fish hatcheries*. Texas Parks and Wildlife Department, Management Data Series 236, PWD RP T3200–1138 (9/05), Austin.
- Gibson, M. T., I. M. Welch, P. R. F. Barrett, and I. Ridge. 1990. Barley straw as an inhibitor of algal growth II: laboratory studies. *Journal of Applied Phycology* 2:241–248.
- Green, J., D. Hibberd, and R. Pienaar. 1982. The taxonomy of *Prymnesium* (Prymnesiophyceae) including a description of a new cosmopolitan species, *P. patellifera* sp. nov., and further observations on *P. parvum* N. Carter. *British Phycological Journal* 17:363–382.
- Guo, M., P. J. Harrison, and F. J. R. Taylor. 1996. Fish kills related to *Prymnesium parvum* N. Carter (Haptophyta) in the People's Republic of China. *Journal of Applied Phycology* 8:111–117.
- Holdway, P., R. Watson, and B. Moss. 1978. Aspects of the ecology of *Prymnesium parvum* (Haptophyta) and water chemistry in the Norfolk Broads, England. *Freshwater Biology* 8(4):295–311.
- Igarashi, T., M. Satake, and T. Yasumoto. 1999. Structures and partial stereochemical assignments for prymnesin-1 and prymnesin-2: potent hemolytic and ichthyotoxic glycosides isolated from the red tide alga, *Prymnesium parvum*. *Journal of American Chemical Society* 121(37):8499–8511.
- James, T., and A. De La Cruz. 1989. *Prymnesium parvum* Carter (Chrysophyceae) as a suspect of mass mortalities of fish and shellfish communities in western Texas. *Texas Journal of Science* 41(4):429–430.
- Johansson, N., and E. Graneli. 1999. Influence of different nutrient conditions on cell density, chemical composition and toxicity of *Prymnesium parvum* (Haptophyta) in semi-continuous cultures. *Journal of Experimental Marine Biology and Ecology* 239(2):243–258.
- Kaartvedt, S., T. M. Johnsen, D. L. Aksnes, U. Lie, and H. Svedsen. 1991. Occurrence of the toxic phytoflagellate *Prymnesium parvum* and associated fish mortality in a Norwegian fjord system. *Canadian Journal of Fisheries and Aquatic Sciences* 48:2316–2323.
- Kiesling, R., B. Brooks, J. Grover, and D. Roelke. 2005. Developing a predictive understanding of *Prymnesium parvum* toxic bloom formation and its control. Report to the Texas Parks and Wildlife Department Golden Alga Task Force, Austin.
- Kurten, G. L., A. Barkoh, L. T. Fries, and D. Begley. 2007. Combined nitrogen and phosphorus fertilization for controlling the toxigenic alga *Prymnesium parvum*. *North American Journal of Aquaculture* 69:214–222.
- Larsen, A. 1999. *Prymnesium parvum* and *P. patelliferum* (Haptophyta)—one species. *Phycologia* 38(6):541–543.
- Larsen, A., and S. Bryant. 1998. Growth rate and toxicity of *Prymnesium parvum* and *Prymnesium patelliferum* (Haptophyta) in response to changes in salinity, light and temperature. *Sarsia* 83(5):409–418.
- Larsen, A., W. Eikrem, and E. Paasche. 1993. Growth and toxicity of *Prymnesium patelliferum* (Prymnesiophyceae) isolated from Nor-

- wegian waters. *Canadian Journal of Botany* 71:1357-1362.
- Lee, R. 1980. Prymnesiophyceae. Pages 155-172 in R. Lee. *Phycology*. Cambridge University Press, Cambridge, UK.
- Linam, G., J. Ralph, and J. Glass. 1991. Toxic blooms, an unusual algae threatens aquatic resources. *Chihuahuan Desert Discovery* 28:6-7.
- Lindholm, T., P. Öhman, K. Kurki-Helasmo, B. Kincaid, and J. Meriluoto. 1999. Toxic algae and fish mortality in a brackish-water lake in Åland, SW Finland. *Hydrobiologia* 397:109-120.
- Lynch, Jr., W. E. 2002. Algae control with barley straw. Ohio State University Extension, Fact Sheet A-12-02, Columbus.
- McLaughlin, J. 1958. Euryhaline chrysomonads: nutrition and toxigenesis in *Prymnesium parvum*, with notes on *Isochrysis galbana* and *Monochrysis lutheri*. *Journal of Protozoology* 5(1):75-81.
- Nejstgaard, J., U. Bamstedt, E. Bagoien, and P. Solberg. 1995. Algal constraints on copepod grazing. Growth state, toxicity, cell size, and season as regulating factors. *Journal of Marine Science* 52:347-357.
- Newman, J. R., and P. R. F. Barrett. 1993. Control of *Microcystis aeruginosa* by decomposing barley straw. *Journal of Aquatic Plant Management* 31:203-206.
- Oh, C., and R. Ditton. 2005. Estimating the economic impacts of golden alga (*Prymnesium parvum*) on recreational fishing at Possum Kingdom Lake (Texas). Report of Texas A&M University to Texas Parks and Wildlife Department, PWD RP T3200-1168 (10/30/2005), Austin.
- Paster, Z. 1973. Pharmacology and mode of action of prymnesin. Pages 241-263 in D. Martin and G. Padilla, editors. *Cell biology: a series of monographs, marine pharmacognosy. Action of marine biotoxins at the cellular level*. Academic Press, New York.
- Rach, J. J., T. M. Schreier, G. E. Howe, and S. D. Redman. 1997. Effect of species, life stage, and water temperature on the toxicity of hydrogen peroxide to fish. *Progressive Fish-Culturist* 59:41-46.
- Reich, K., and I. Parnas. 1962. Effect of illumination on ichthyotoxins in an axenic culture of *Prymnesium parvum* Carter. *Journal of Protozoology* 9(1):38-40.
- Reichenbach-Klinke, H. 1973. *Fish Pathology*. TFH Publications, Neptune City, New Jersey.
- Sager, D., L. Fries, L. Singhurst, and G. Southard, editors. 2007. Guidelines for golden alga *Prymnesium parvum* management options for ponds and small reservoirs (public waters) in Texas. Texas Parks and Wildlife Department, PWD RP T3200-1404 (1/2007), Austin.
- Sengco, M., and D. Anderson. 2005. Removal of *Prymnesium parvum* through clay and chemical flocculation. Report of Woods Hole Oceanographic Institution to Texas Parks and Wildlife Department, PWD RP T3200-177, Austin.
- Shilo, M. 1972. Toxigenic algae. Pages 233-265 in O. Hockenhill II, editor. *Progress in industrial microbiology*, volume 2. Churchill Livingstone Press, Edinburgh, UK.
- Shilo, M., and M. Aschner. 1953. Factors governing the toxicity of cultures containing phytoflagellate *Prymnesium parvum* Carter. *Journal of General Microbiology* 8:333-343.
- Shilo, M., and S. Sarig. 1989. Appearance and control of the toxigenic Chrysophyte *Prymnesium parvum*. Pages 170-172 in M. Shilo and S. Sarig, editors. *Fish culture in warm water systems: problems and trends*. Franklin Book Company, Elkins Park, Pennsylvania.
- Shilo, M., and M. Shilo. 1953. Conditions which determine the efficiency of ammonium sulphate in the control of *Prymnesium parvum* in fish breeding ponds. *Applied Microbiology* 1:330-333.
- Shilo, M., and M. Shilo. 1962. The mechanism of lysis of *Prymnesium parvum* by weak electrolytes. *Journal of General Microbiology* 29:645-658.
- Singhurst, E., and D. Sager, editors. 2004. Golden alga (*Prymnesium parvum*) workshop summary report. Texas Parks and Wildlife Department, ACTS-2004-001. PWD RP T3200-1203, Austin.
- Smith, D. G., 2005a. Dundee State Fish Hatchery *Prymnesium parvum* management plan. Pages 80-84 in A. Barkoh, and L. T. Fries, editors. *Management of Prymnesium parvum at Texas state fish hatcheries*. Texas Parks and

- Wildlife Department, Management Data Series 236, PWD RP T3200-1138 (9/05), Austin.
- Smith, D. G., 2005b. Efficacy of potassium permanganate to reduce *Prymnesium parvum* ichthyotoxicity. Pages 17-19 in A. Barkoh, and L. T. Fries, editors. Management of *Prymnesium parvum* at Texas state fish hatcheries. Texas Parks and Wildlife Department, Management Data Series 236, PWD RP T3200-1138 (9/05), Austin.
- Southard, G. M., 2005. Use of hydrogen peroxide as an algacide for *Prymnesium parvum*. Pages 35-38 in A. Barkoh, and L. T. Fries, editors. Management of *Prymnesium parvum* at Texas state fish hatcheries. Texas Parks and Wildlife Department, Management Data Series 236, PWD RP T3200-1138 (9/05), Austin.
- Southard, G. M., and D. Klein. 2005. Effects of pH on *Prymnesium parvum* cell viability and toxicity. Pages 29-34 in A. Barkoh, and L. T. Fries, editors. Management of *Prymnesium parvum* at Texas state fish hatcheries. Texas Parks and Wildlife Department, Management Data Series No. 236, PWD RP T3200-1138 (9/05), Austin.
- Swanson, E. 2006. Guidelines for preventing and responding to golden alga blooms. Arizona Game and Fish Department, Phoenix.
- Tillmann, U. 2004. Interactions between planktonic microalgae and protozoan grazers. *Journal of Eukaryote Microbiology* 156-168.
- Tucker, C. S. 1989. Method for estimating the potassium permanganate disease treatment rates for channel catfish ponds. *Progressive Fish-Culturist* 51:24-26.
- Ullitzer, S., and M. Shilo. 1964. A sensitive assay system for determination of the ichthyotoxicity of *Prymnesium parvum*. *Journal of General Microbiology* 36(2):161-169.
- Ullitzer, S., and M. Shilo. 1966. Mode of action of *Prymnesium parvum* ichthyotoxins. *Journal of Protozoology* 13(2):332-336.
- Welch, I. M., P. R. F. Barrett, M. T. Gibson, and I. Ridge. 1990. Barley straw as an inhibitor of algal growth I: studies in the Chesterfield Canal. *Journal of Applied Phycology* 2:231-239.
- Yariv, J., and S. Hestrin. 1961. Toxicity of the extracellular phase of *Prymnesium parvum* cultures. *Journal of General Microbiology* 24(2):165-175.

Prymnesium parvum Growth Studies Using the Dunkard Creek Isolate (WANA Strain)

Report submitted to:
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Introduction

The golden alga *Prymnesium parvum* bloomed in Dunkard Creek (WV-PA) in September and October 2009 resulting in devastating fish, mussel, and salamander kills over a 30 mile stretch of the stream. Preliminary investigations led to the hypothesis that increased salinities resulting from high saline discharges by local mining activity were conducive to the bloom. Study with strains of *P. parvum* isolated from Texas and Oklahoma, in waters of relatively high salinities, suggest that *P. parvum* growth rates are depressed at lower salinities. It is further hypothesized growth rates of the Dunkard Creek strain of *P. parvum* might also be reduced at lower salinities. If so, a possible management action aimed at Dunkard Creek salinity reduction is warranted. The purpose of this study was to analyze growth rates of the Dunkard Creek *P. parvum* strain at different salinities.

Methods

The strain of *P. parvum* that was found in the Dunkard Creek Watershed and identified as the proximate cause of fish and other aquatic life kills in September and October 2009 was used to establish laboratory cultures at University of Oklahoma Biological Station (UOBS). Water from Dunkard Creek was shipped to UOBS for establishment of non-axenic cultures in modified COMBO medium (Kilham et al. 1998) with high salinity (6 or 15 g Instant Ocean L⁻¹; equivalent to ~10,000 and 23,000 $\mu\text{S cm}^{-1}$, respectively) and high nutrients (800 and 50 $\mu\text{ moles L}^{-1}$ N and P). Cultures used in experiments reported here (WANA 576 and WANA 578; different cell lineages isolated from the original water sample) were >99% pure, with unidentified green unicells and diatoms present in extremely low abundances.

We performed two replicate 6-day experiments (experiments 1 and 2) and one 14-day experiment (experiment 3) to track golden algae growth rates (absolute and relative to other Dunkard Creek algae present in cultures) across gradients of salinity. In experiments 1 and 2, salinity treatments were created to mimic the 4:1 sulfate and chloride concentrations in Dunkard Creek water in the area of the coal mine discharge (2 g sulfate, as calcium sulfate, and 0.5 g chloride, as sodium chloride, L⁻¹; i.e., full-strength or 1 \times mine pool water) and multiple dilutions of full-strength mine discharge water (i.e., at 0.5 \times , 0.25 \times , 0.125 \times , 0.06 \times , and 0 \times mine pool water). All salinity treatments were replicated 5 times. Experiments were conducted in 250- (experiment 1) and 125-mL (experiment 2) Erlenmeyer flasks at room temperature and on a 12-hr light:12-hr dark schedule. Following inoculation of experimental flasks, golden algal densities were tracked using flow cytometry-based enumeration of cell densities initially and every second day. Both experiments were terminated after 6 days due to high incidence of contamination in experimental cultures. Experiment 3 was set up in a similar manner, but using Instant Ocean to establish the salinity gradient (0, 2, 4, 6, 10, and 15 g Instant Ocean L⁻¹, three replicates each) and was run for 14 days to measure both, initial growth rates of golden algae, but also to quantify golden algae's growth response to different salinities relative to other algae in the cultures.

Experiment 1 was initiated from a WANA 576 culture containing 7,600 cells mL⁻¹, by adding 30-mL aliquots to 1-L flasks containing COMBO, 80 $\mu\text{ mole N}$ and 5 $\mu\text{ mole P L}^{-1}$, and variable salinities. Each liter was then divided evenly among five 250-mL Erlenmeyer flasks, 150 mL each, with starting densities of golden algae ~228 cells mL⁻¹ in each flask. Experiment 2 was initiated from a WANA 576 culture containing 10,800 cells mL⁻¹, by adding 15-mL aliquots to 500-mL flasks containing COMBO and variable salinities as above. Each liter was then divided evenly among five 125-mL Erlenmeyer flasks, 75 mL each, with starting densities of golden algae ~324 cells mL⁻¹ in each flask. Experiment 3 was initiated from WANA 578 culture containing 2,020,000 cells mL⁻¹, by adding 3.5-mL aliquots to 500-mL flasks

containing COMBO, 80 μ mole N and 5 μ mole P L⁻¹, and variable salinities. Starting densities of golden algae in each flask were ~15,000 cells mL⁻¹.

Salinity for each sample was measured as conductivity (Hach HQ40d meter) at 22.4 C and recorded in μ S cm⁻¹. pH was measured using a Fisher Accumet pH Meter Model 915. Flasks were swirled daily. Initially, and every second day, a 500 μ L sample was analyzed on a BD FACSCaliber flow cytometer to determine golden algal cell densities. For Experiment 3, densities of contaminant algae were also recorded. Additional samples from all experiments were preserved in Lugol's solution and used to verify flow cytometer counts.

In all sulfate-chloride salinity treatments of experiments 1 and 2, the sudden change in culture medium from COMBO with Instant Ocean to COMBO with sulfates and chlorides only as the source of salts resulted in high mortality of golden algae (mean = 37%). Similar initial mortality, or shock, has been observed previously when transferring golden algae to new culture medium conditions. After two days, all cultures had recovered and were growing well, except the highest sulfate-chloride treatments, which are not considered in the analyses below. Maximum growth rates in each treatment were calculated as the slope of the exponential regression of cell density and time (Fig. 1). Maximum growth rates of *P. parvum* in experiment 3 were calculated using data from day 0 to day 7.

Results

Both experiments 1 and 2 revealed similar responses of WANA 576 to changes in salinities using sulfates and chlorides and have been combined for analysis. Growth rates of *P. parvum* between day 2 and day 6 were positive, but declined with declining salinities, especially below 1000 μ S cm⁻¹ (Fig. 2). Experiments were terminated after day 6 because of relatively high contamination (data not shown). Experiment 3 revealed that the decline in *P. parvum* growth rates with declining salinity, as well as the high level of contamination over time was not an artifact of using sulfate and chloride as sources of salinity in the cultures. Growth rates in the lowest salinity treatment were more than 50% lower than in the highest salinity treatment (Fig. 3). Although all treatments were eventually highly contaminated over time, the level of contamination increased with decreasing salinity (Fig. 4). The contaminants, a small diatom and unidentified green unicell (~4 μ m diameter), both presumably from the original Dunkard Creek water and present in all cultures at extremely low abundances, had highest growth rates in low salinity treatments and declining growth rates with increasing salinity (Fig. 5).

Discussion and Conclusions

All experiments revealed a relatively strong relationship between *P. parvum* and culture salinities. Patterns observed for isolates from Dunkard Creek were similar to patterns observed previously in other *P. parvum* isolates (Baker et al. 2007). In general, positive growth rates can be maintained by *P. parvum* across a broad range of salinities (note that Expt 3 salinities covered a much greater range of salinities – up to 15 g L⁻¹ Instant Ocean, maximum conductivities >20,000 μ S cm⁻¹), but growth rates are substantially lower at salinities equivalent to those observed in most fresh waters (i.e., < 1000 μ S cm⁻¹). Moreover, our experiments revealed that not only are *P. parvum* growth rates reduced at lower salinities, but that growth rates of other, presumably native, algae are enhanced at lower salinities. Thus reduced salinities shift the competitive edge from *P. parvum* to other algae.

Reasons behind the lack of *P. parvum* growth in the highest sulfate-chloride treatment are not known. The maximum conductivity obtained with the addition of 2 g of sulfate and 0.5 g of chloride was 4,275 μ S cm⁻¹, although the actual amount of sulfate in solution was less than 100%. Compared with Instant Ocean, our standard salinity source of *P. parvum* cultures, this amount of sulfate is high. At 6.6% sulfate by weight, our highest salinity cultures (i.e., 15 g Instant Ocean L⁻¹) contain 1.0 g sulfate L⁻¹, or half the

amount added in the high treatments of experiments 1 and 2. Studies have shown that high sulfates can interfere with nitrogenases in phytoplankton, particularly those associated with nitrogen fixation in cyanobacteria (Marino et al. 1990). But it is also possible that other nitrogenases, such as those used in nitrate assimilation, might also be negatively affected.

High calcium concentrations could be another factor involved with lack of *P. parvum* growth in the high sulfate-chloride treatments and overall low growth rates in all sulfate-chloride treatments (experiments 1 and 2) relative to Instant Ocean treatments (experiment 3) (c.f. Figs. 2 and 3). Sulfates were added as calcium sulfate, in which there is 466 mg of calcium for every 1 g of sulfate. Instant Ocean contains only 1.02% calcium by weight. Thus a 15 g Instant Ocean L⁻¹ culture contains only 153 mg calcium L⁻¹. Studies have demonstrated that calcium ions can act as cofactors to *P. parvum* toxins, increasing their toxicity substantially (Shilo 1981). As such, it is conceivable that our use of calcium sulfate inadvertently created conditions of higher toxicity, which may have negatively affected growth or increased mortality via self-toxicity (Olli and Trunov 2007).

Nevertheless, further research could add substantially to our understanding of specific factors involved in the 2009 Dunkard Creek *P. parvum* bloom. In particular, it is recommended that further monitoring and analysis of the chemical composition of the mine water discharges be conducted in order to enhance understanding of the roles of high sulfates and other ions in *P. parvum* population growth and toxicity. Further experimentation also will be required to confidently assess the relative roles of sulfates, calcium, or other ions, in *P. parvum* growth and toxicity in general, but also with respect to the potential for future Dunkard Creek *P. parvum* blooms. While our experiments were conducted in the laboratory with artificially nutrient replete culture media, and there remains uncertainty with respect to sulfates and calcium as described above, our results corroborate the general understanding of *P. parvum* populations, blooms, and fish kills globally – high nutrients and high salinities are major requisites for *P. parvum* domination of algal communities, and especially for *P. parvum* blooms.

Acknowledgments

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Literature cited

- Baker, J. W., J. P. Grover, B. W. Brooks, F. Urena-Boeck, D. L. Roelke, R. Errera, and R. L. Kiesling. 2007. Growth and toxicity of *Prymnesium parvum* (Haptophyta) as a function of salinity, light, and temperature. *J. Phycol.* **43**: 219-227.
- Marino, R., R. W. Howarth, J. Shames, and E. Prepas. 1990. Molybdenum and sulfate as controls on the abundance of nitrogen-fixing cyanobacteria in saline lakes in Alberta. *Limnol. Oceanogr.* **35**: 245-259.
- Olli, K., and K. Trunov. 2007. Self-toxicity of *Prymnesium parvum* (Prymnesiophyceae). *Phycologia* **46**: 109-112.
- Shilo, M. 1981. The toxic principles of *Prymnesium parvum*, p. 37-47. In W. W. Carmichael [ed.], *The water environment: algal toxins and health*. Plenum Press.

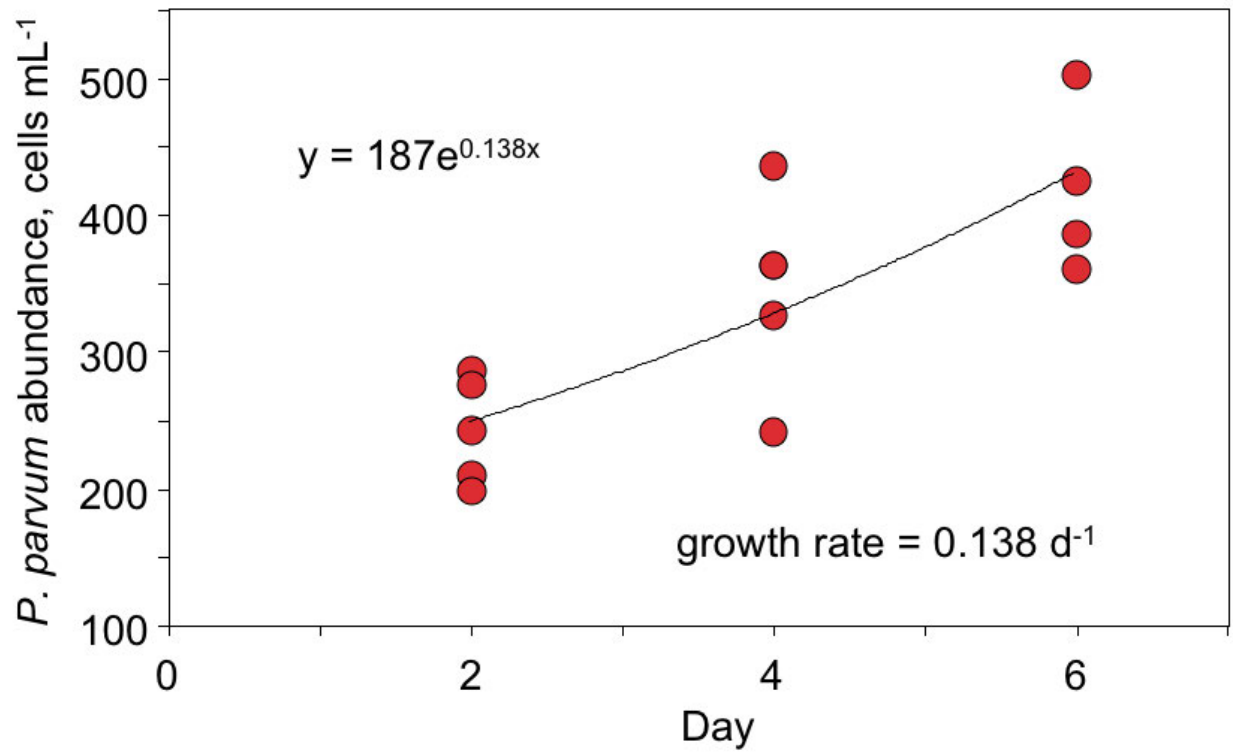


Figure 1. Representative example of growth rate calculation. Points represent *P. parvum* cell densities in experimental flasks (in this case, the 0× treatment of experiment 1) on days 2, 4, and 6. The slope (i.e., the exponent) of an exponential regression through these points is a measure of the instantaneous growth rate in units of per day.

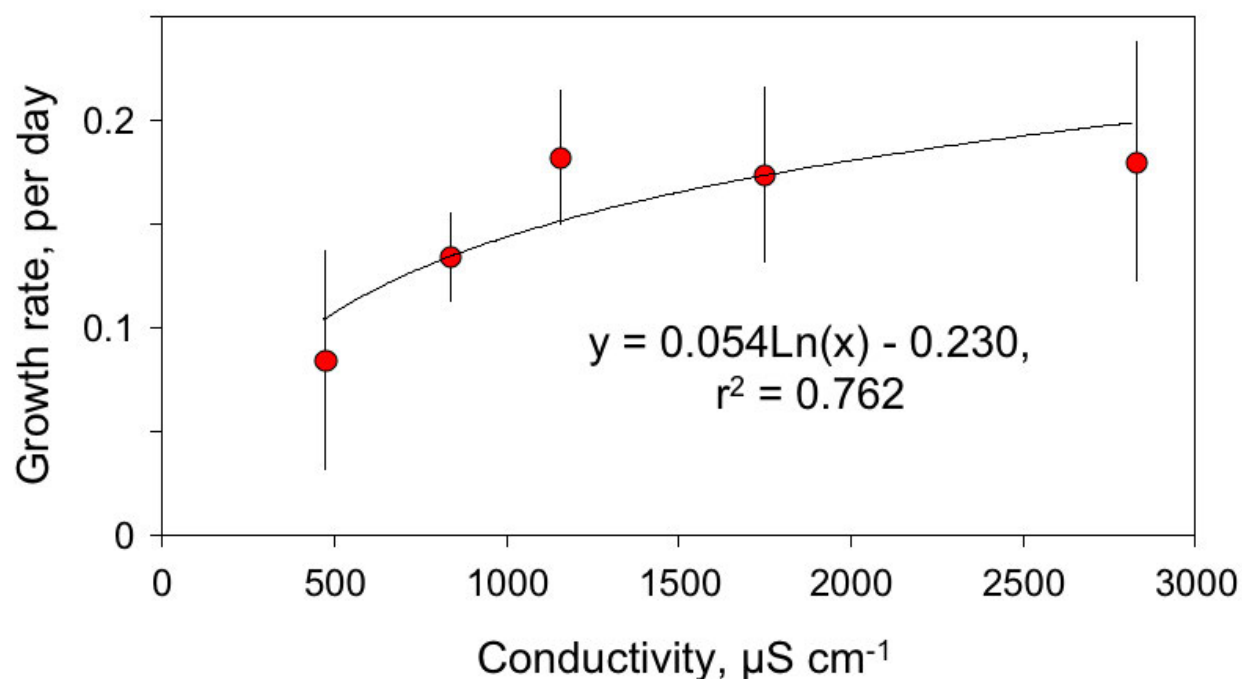


Figure 2. Growth rate of *P. parvum* as a function of sulfate and chloride concentrations (here indicated by conductivity ($\mu\text{S cm}^{-1}$)). Treatments, each replicated 5-fold per experiment and from highest to lowest conductivity, are 1000 mg sulfate and 250 mg chloride, 500 mg sulfate and 125 mg chloride, 250 mg sulfate and 62.5 mg chloride, 125 mg sulfate and 31.3 mg chloride, and 0 mg sulfate and 0 mg chloride. Points represent mean ($\pm\text{SE}$) values generated separately from experiments 1 and 2 using *P. parvum* cell densities from day 2 to day 6. The highest salinity treatment (2000 mg sulfate and 1000 mg chloride, $\sim 4,082 \mu\text{S cm}^{-1}$) was not conducive to *P. parvum* growth and has been omitted here.

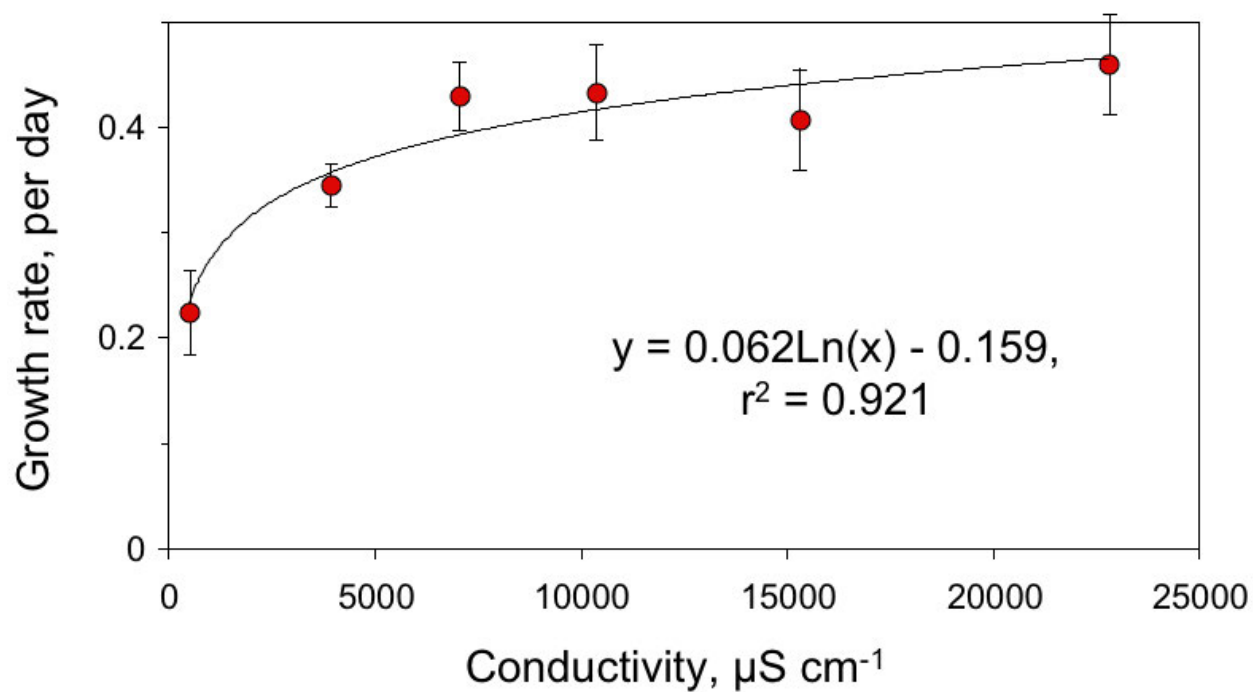


Figure 3. Growth rate of *P. parvum* as a function of Instant Ocean concentrations (here indicated by conductivity ($\mu\text{S cm}^{-1}$)). Treatments, from highest to lowest conductivity, are 15, 10, 6, 4, 2, and 0 g Instant Ocean L^{-1} . Points represent mean ($\pm\text{SE}$) values generated from day 0 to day 7 growth of *P. parvum* in each treatment from Experiment 3.

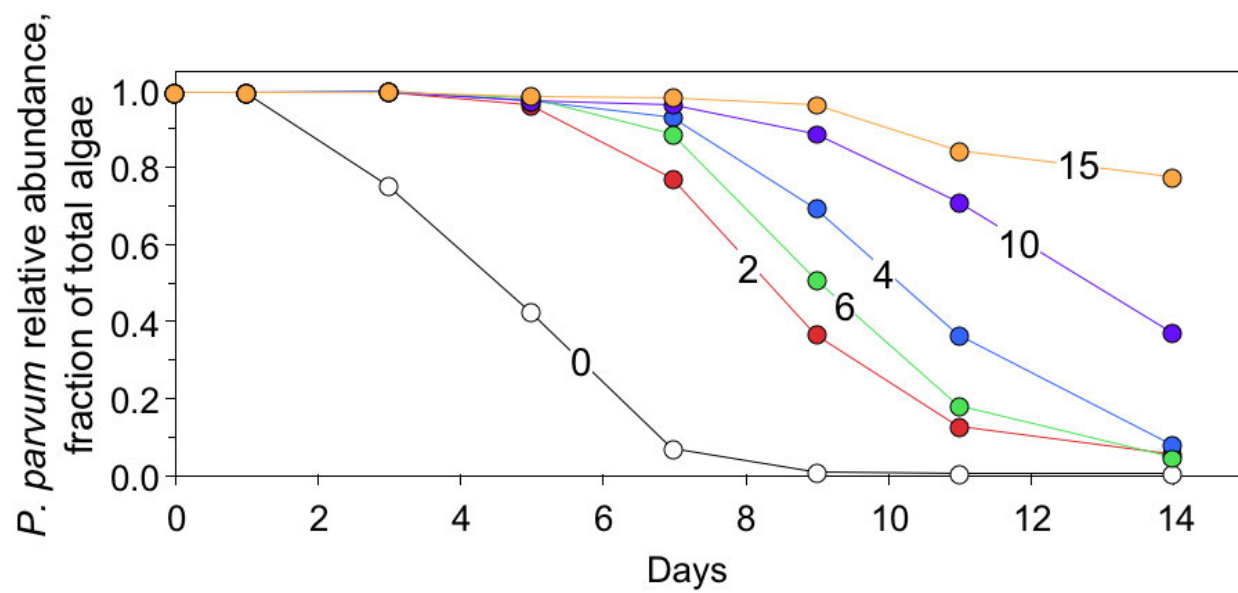


Figure 4. Relative abundance of *P. parvum* (fraction of total algae) in salinity treatments over time in experiment 3. Treatments (i.e., g Instant Ocean L⁻¹) are indicated.

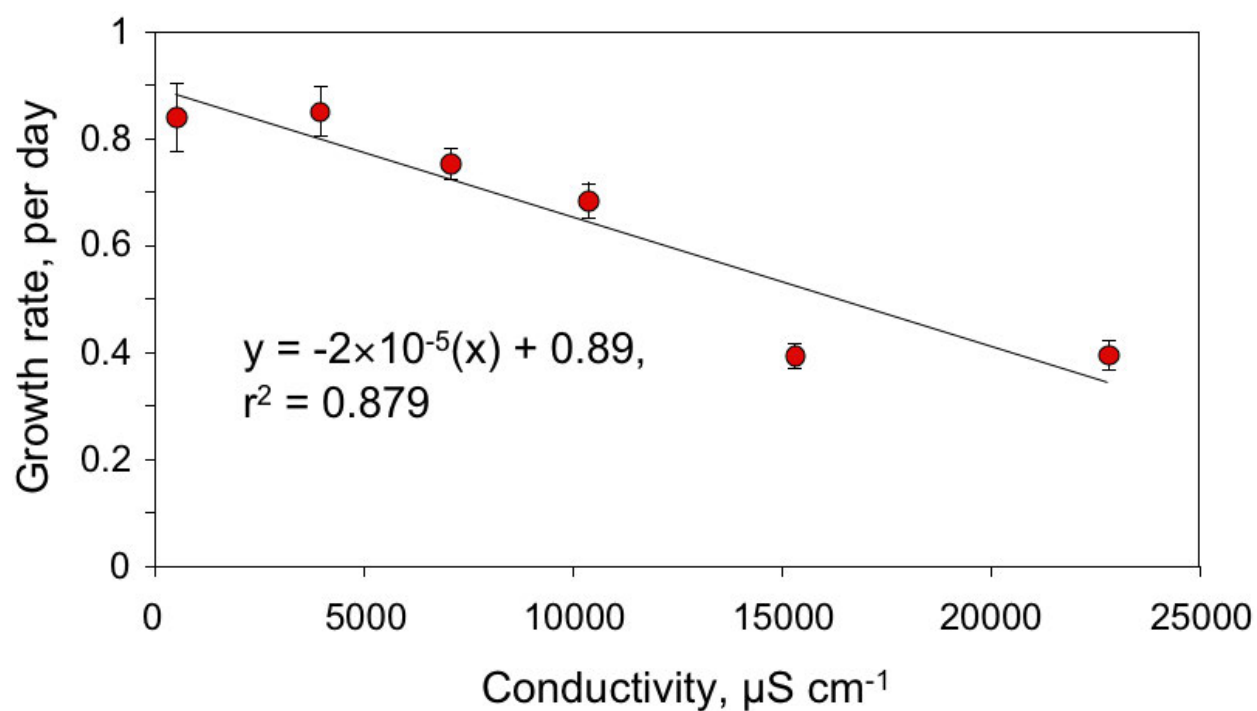


Figure 5. Growth rate of contaminant algae (small unidentified diatom and green unicell) in experiment 3 as a function of Instant Ocean concentrations (here indicated by conductivity ($\mu\text{S cm}^{-1}$)). Rates were calculated from cell densities in days 3 through 14.

Growth at the edge of the niche: An experimental study of the harmful alga *Prymnesium parvum*

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Abstract

The haptophyte *Prymnesium parvum* forms harmful blooms toxic to fish in coastal and inland waters. Its growth in relation to niche factors is poorly characterized for the low salinities found in the inland waters in which *P. parvum* blooms have occurred. The specific growth rate of *P. parvum* as a function of temperature and salinity was determined in nutrient sufficient cultures with low salinity. Additionally, phosphorus limited growth was determined at low salinity and temperatures at or below 20°C. In nutrient sufficient cultures, decreasing salinity from 4 g L⁻¹ to 0.5 g L⁻¹ reduced the growth rate of *P. parvum*. The estimated optimal temperature for growth decreased with decreasing salinity from about 27°C at salinities above 10 g L⁻¹, to about 24°C at 4 g L⁻¹, to about 22°C at 0.5 g L⁻¹. In phosphorus limited experiments, the half saturation concentration for growth was less than 0.02 μmol L⁻¹ under most conditions. The phosphorus saturated growth rate was 0.84 d⁻¹ at 4 g L⁻¹ salinity and 20°C, and it was reduced at lower salinities and temperatures. The salinity temperature interaction found here weakens the negative effect of low temperature on growth at low salinity and might partially explain why blooms of *P. parvum* occur in the winter months in inland waters of the southwestern United States. However, the relatively slow growth of *P. parvum* at low temperature and salinity suggests that additional factors should be examined, such as reduced effects of competitors, pathogens, and grazers during winter.

Harmful algal blooms are among the water-quality problems receiving growing attention from aquatic scientists. There is a perception that the frequency of such blooms has increased over recent decades (Hallegraeff 1993; Sunda et al. 2006), perhaps due to ongoing eutrophication, aquaculture, and other anthropogenic changes. In some cases, the species responsible are classified as invasive because they have become abundant in locations where they were previously unnoticed. Examples include the invasion of warm, shallow lakes in temperate climate zones by the cyanobacterium *Cylindrospermopsis raciborskii* (Briand et al. 2004; Wiedner et al. 2007), as well as the focus of this paper: the haptophyte *Prymnesium parvum*, which is apparently invading brackish inland waters of the southwestern United States (James and De La Cruz 1989; Edvardsen and Paasche 1998; Roelke et al. 2007).

Studies of niche factors and resources likely to limit population growth may improve our understanding and ability to predict the spread of invasive, harmful algal species. Such approaches have long been applied in algal ecology (Rhee 1982), and quantitative information on responses to niche factors and resources is available for many species (Tilman et al. 1982; Grover 1989). However, this information is sparse for many harmful algal species of contemporary interest, including *P. parvum*.

Previous studies of the growth of *P. parvum* in relation to physical and chemical niche factors covered salinities characteristic of estuarine and coastal waters, up to about

35 g L⁻¹, with very few observations below 4 g L⁻¹ (Larsen et al. 1993; Larsen and Bryant 1998; Baker et al. 2007). Lower salinities of 1–3 g L⁻¹ are common in most of the brackish inland waters of the southwestern United States where *P. parvum* blooms have occurred, and thus previous research provides only a limited characterization of its growth at salinities characteristic of such inland waters. Furthermore, there are no published studies that provide parameter estimates for commonly used kinetic models of nutrient-limited growth, such as the Monod model and its modifications (Istvánovics et al. 2000).

A lack of information about the specific growth rate of *P. parvum* at low salinities and nutrient concentrations hinders quantitative analysis of the potential for harmful blooms in many inland waters. Predictive, mechanistic models of bloom dynamics conventionally describe algal growth using a maximal rate that depends on physical factors multiplied by saturation terms that describe nutrient limitation (Chapra 1997). This study provides the necessary information for such models. Specific growth rates, abundances, and toxicity to fish under nutrient-sufficient conditions were measured in a factorial experiment at temperature and salinity levels characteristic of inland waters of the southwestern United States where harmful blooms have occurred. Additional experimental treatments compared specific growth rates at the ionic composition of seawater to specific growth rates at an ionic composition simulating inland waters. At selected combinations of temperature, salinity, and ion composition, specific growth rates were measured for a range of low-phosphorus (P) concentrations. Although the physical and

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chemical niche has been studied for many algae, growth is usually characterized under conditions near optimum or across a wide range. Here, we focus on growth of *P. parvum* at the edge of the niche, in terms of salinity, an uncommon approach but one that may be valuable for understanding invasive species (Briand et al. 2004).

Methods

General culture methods The strain of *P. parvum* culture used in this study (Culture Collection of Algae at the University of Texas at Austin, UTEX LL 2797) was isolated by J. Glass from a bloom in Texas and used in previous laboratory studies (Baker et al. 2007; Grover et al. 2007). For stock cultures, an artificial seawater (ASW) medium was prepared according to Kester et al. (1967), diluted to a working salinity of 5.8 g L⁻¹ in ultrapure water (Millipore Milli-Q, 18 MΩ cm⁻¹), and then enriched with f/2 levels of nitrogen (N), P, trace metals, and vitamins (MacLachlan 1973). In the trace-metals solution, an equimolar amount of ferric chloride was substituted for ferrous ammonium sulfate due to the toxicity of ammonium to *P. parvum* (Grover et al. 2007). An additional medium simulated inland waters of western Texas affected by *P. parvum* using an ion composition similar to Lake Whitney, Texas, which was ascertained during an active bloom. This artificial lake-water (ALW) medium was modified from ASW as follows: the same molar concentration of Mg was added as MgSO₄ instead of MgCl₂ to produce higher sulfate concentrations; eightfold higher additions of CaCl₂·2H₂O were used; and eightfold higher additions of NaHCO₃ were added aseptically after autoclaving. For both ASW and ALW, full-strength preparations of the basal salts were diluted as needed with ultrapure water to achieve experimental salinities.

Stock cultures of *P. parvum* were maintained by monthly transfers in an incubator at 20°C and on a 12:12 h light:dark photoperiod with an irradiance of about 150 μmol m⁻² s⁻¹. This photoperiod was used for all stock and experimental cultures because blooms typically begin in Texas at approximately this photoperiod in autumn. Irradiance of experimental cultures was also 150 μmol m⁻² s⁻¹, a value similar to average water-column irradiances in Texas lakes (Grover and Chrzanowski 2004). Illumination and culture-vessel positions were adjusted based on irradiance values measured with a photon flux meter (LiCor model LI-1400) in several areas inside of the incubators.

Nutrient-sufficient experiment This experiment determined the growth rate and toxicity of *P. parvum* in response to temperature and low levels of salinity, along with additional treatments that examined the ion composition of the medium. All nutrients were provided at the high concentrations used in stock cultures to exclude limitation. To quantify curvilinear or unimodal responses to temperature and salinity, and their interactions, a duplicated 3 × 3 factorial experimental design was used with salinities of 0.5, 1.0, and 4 g L⁻¹, and temperatures of 11°C, 20°C, and 29°C (Table 1). For this design, ASW medium was used.

Table 1. Design for the nutrient sufficient experiment. Ion composition was artificial seawater (ASW) or lake water (ALW) medium. There were duplicate cultures for each combination of medium, temperature, and salinity.

Ion composition	Salinity (g L ⁻¹)	Temperature (°C)
ASW	0.5	11, 20, 29
	1	11, 20, 29
	4	11, 20, 29
	17.8	20
	0.5	20
ALW	1	20
	4	20
	17.8	20

Additional treatments at 20°C were added to compose a duplicated 4 × 2 factorial design with four salinities (0.5, 1, 4, and 17.8 g L⁻¹) crossed with two ion compositions (ASW or ALW media). The high-salinity treatment of 17.8 g L⁻¹ was included to facilitate comparison to a similar experiment done over a higher salinity range (Baker et al. 2007).

After diluting basal salts to the experimental salinity, NaNO₃ was added. Other nutrients (NaH₂PO₄, NaHCO₃, vitamins, trace metals) were added aseptically after autoclaving (filter-sterilization through Nalgene 0.2-μm, nylon syringe filters). The same concentration of NaHCO₃ was added to all cultures of a given medium (ASW vs. ALW), so that dissolved inorganic carbon (DIC) availability would not be affected by the experimental adjustments of salinity. All ALW cultures received 2480 μmol L⁻¹ of bicarbonate, and all ASW cultures received 379 μmol L⁻¹ of bicarbonate. One-liter borosilicate glass flasks were filled to a working volume of 800 mL, and each flask was inoculated with 100 cells mL⁻¹ of *P. parvum* from stock cultures in late exponential phase grown in the corresponding ion composition at the stock salinity of 5.8 g L⁻¹. Inoculated flasks of appropriate salinity were then distributed to incubators at different temperatures to achieve the treatment combinations in the experimental design. Flasks were mixed daily by gently swirling, and positions within incubators were rotated daily.

Samples of experimental batch cultures were taken on days 2, 4, 7, 9, 11, 14, 17, and 21. Populations reached stationary phase during this time. At each sampling, aliquots of 5 mL were preserved with 0.15 mL of Lugol's iodine (Thronsen 1978) for counts of *P. parvum*. Stock and experimental cultures were not axenic, so aliquots of 10 mL were preserved with 0.5 mL of formalin for bacterial counts. Cell concentration of *P. parvum* was obtained by direct microscopic counts, using sedimentation chambers and inverted microscopy (Margalef 1969). Cell concentrations of bacteria were obtained by direct counts of cells stained with acridine orange, collected on polycarbonate filters, and examined with epifluorescence microscopy (Hobbie et al. 1977). Maximum bacterial abundance in experimental cultures reached 2.65 × 10⁷ cells mL⁻¹, although most cultures were below this, with an average abundance of 7.84 × 10⁶ cells mL⁻¹. Bacterial data were not further analyzed. Specific growth rate (μ) of *P. parvum*

in each culture was estimated by regressing the natural logarithm of cell concentration against time for days 2 to 9. Stationary cell concentration was taken as the average for days 17 and 21. On day 21, pH was determined with a calibrated electrode.

Acute toxicity was assessed for samples taken on day 21 by completing 48-h bioassays with <48-h-old fathead minnows (*Pimephales promelas*) according to U.S. Environmental Protection Agency (EPA) test method 2000.0 (USEPA 2002). The fish were fed newly hatched *Artemia nauplii* 2 h prior to test initiation. Their survival was assessed with whole-culture samples and at a series of six successive dilutions (0.5 at each step) from 50% to 1.56% (duplicate batches of five fish per dilution level). Reconstituted hard water (APHA 1998) was used as the dilution water and as a control, and additional controls were prepared by diluting samples of sterile culture media (ASW, ALW without algae). The percentage dilution of the whole sample causing 50% mortality of subjects (LC_{50}) was estimated using Probit (Finney 1971) or Trimmed Spearman Karber (Hamilton et al. 1977) methods, as appropriate. To compare toxicity among cultures with different populations of *P. parvum*, the percentage LC_{50} values were then multiplied by stationary cell concentration to estimate LC_{50} as the concentration of cells causing 50% mortality of subjects. For example, a culture with a stationary cell concentration of 4.9×10^5 cells mL^{-1} was estimated to kill 50% of subjects when diluted to 7.9% of its original concentration, giving a calculated LC_{50} of 3.9×10^4 cells mL^{-1} .

Specific growth rate (μ) was analyzed using multiple regression, where the independent variables of temperature and salinity were centered on their means to reduce collinearity. A full model was fitted to data from salinities of 0.5 to 4.0 g L^{-1} with quadratic and interaction terms for temperature and salinity, a categorical variable for ion composition, and linear and quadratic interaction terms between ion composition and salinity. Interactions between ion composition and temperature could not be estimated given the experimental design.

To allow the unimodal response to temperature to be asymmetric, temperature data were transformed using the equation (Baker et al. 2007):

$$T_{transform} = \exp\left(\frac{\theta(T-20)}{20}\right) \quad (1)$$

where T is temperature ($^{\circ}C$), and θ is a transformation parameter, the value of which was chosen to maximize fit (R^2) of the full model. A best subset regression scheme was then used to find a simpler regression model with acceptable fit using Mallows's C_p statistic (Kleinbaum et al. 1998), excluding models having higher-order terms without the corresponding linear terms. Residual plots were examined for failures of the regression assumptions. Two-way factorial analysis of variance (ANOVA) was used to analyze LC_{50} in relation to salinity and ion composition for a subset of cultures in which acute toxicity to fish was detected.

Nutrient-limited experiments These experiments used a short-term batch culture method (Tilman and Kilham

1976) to determine the responses of specific growth rate (μ) to limiting concentrations of P under selected combinations of temperature, salinity, and ion composition. Prior to inoculation of experimental cultures to determine P-limited growth kinetics, populations of *P. parvum* were preconditioned to reduce cellular P storage. This preconditioning was done by growth to stationary phase in media with reduced P concentration ($3.6 \mu mol L^{-1}$, 1/10 of the f/2 concentration). Preconditioned cultures for experiments at $20^{\circ}C$ were grown for 4 weeks; those for experiments at $10^{\circ}C$ were grown for 8 weeks due to slower growth.

With one exception, preconditioning cultures were duplicated for all experiments. Periodically, samples of 5 mL were taken from preconditioning cultures and preserved with Lugol's iodine for counts of *P. parvum*. At the end of preconditioning, samples of 50 mL were filtered ($0.2 \mu m$) for soluble reactive phosphorus (SRP) analysis (Strickland and Parsons 1972). Samples of 50 mL were also filtered onto GF/F filters and stored frozen for later determination of particulate phosphorus (PP) by wet digestion with persulfate (Menzel and Corwin 1965) followed by SRP analysis. Samples of 100 mL were filtered onto precombusted GF/F filters for determinations of particulate C and N with a Perkin-Elmer CHN analyzer. Inoculation of preconditioning cultures sometimes carried non-negligible amounts of dissolved P to experimental cultures from inoculation, and such carryover was calculated from SRP measurements and added to the experimental P concentration.

Cell quota of P at the end of preconditioning was calculated as PP divided by cell concentration. Particulate composition data were not obtained for the experiment in ASW medium at $20^{\circ}C$ and 4 g L^{-1} . A three-way factorial ANOVA was used to analyze cell (i.e., particulate) composition of preconditioned cultures in relation to temperature, salinity, and ion composition.

After dilution of basal salts to obtain the experimental salinity, vitamins, trace metals, and $NaNO_3$ were added at f/2 concentrations. After autoclaving, $NaHCO_3$ and NaH_2PO_4 were added aseptically (filter-sterilization through Nalgene $0.2\text{-}\mu m$, nylon syringe filters); the same concentrations of $NaHCO_3$ were added to ASW and ALW media in the nutrient-sufficient experiment. For the experiment in ASW medium at $20^{\circ}C$ and 4 g L^{-1} salinity, 24 flasks were prepared and autoclaved with 600 mL of media each. Four replicates were then prepared for each target concentration of P: 0, 0.01, 0.1, 0.5, 1, and $10 \mu mol L^{-1}$. Cultures for the remaining experiments were prepared similarly, except that 12 flasks were used, giving duplicate cultures at each target P concentration. Each experimental culture was inoculated with 100 cells mL^{-1} of *P. parvum* from a preconditioning culture grown under the same temperature, salinity, and ion composition.

Experimental cultures were incubated for 4 d, mixed daily by gently swirling, and positions of flasks within the incubators were rotated daily. Samples of 100 mL were taken daily from each experimental flask and preserved with Lugol's solution. Subsamples from preserved samples were settled in large-volume sedimentation chambers (50–100 mL) and counted with an inverted microscope to

Table 2. Acute (48 h) cellular toxicity (LC_{50}) of *P. parvum* to juvenile *Pimephales promelas* in relation to salinity and temperature. Each sample is a combination of salinity ($g\ L^{-1}$) and media type (ASW or ALW). All cultures were grown at $20^{\circ}C$.

Salinity ($g\ L^{-1}$)	Medium	LC_{50} (cells mL^{-1})
4	ASW	39,000
4	ASW	47,000
4	ALW	32,000
4	ALW	67,000
17.8	ASW	52,000
17.8	ASW	56,000
17.8	ALW	65,000
17.8	ALW	22,000

determine cell concentration. On day 4, samples of 50 mL were filtered ($0.2\ \mu m$) for SRP analysis to evaluate nutrient depletion below the target concentration during the incubations.

Samples from the first day were very sparse, with unacceptable counting errors, so μ was estimated by regressing the natural logarithm of cell concentration against time for days 2–4. Specific growth rate was analyzed in relation to P concentration using two kinetic models: the conventional Monod model (Tilman et al. 1982; Grover 1989),

$$\mu = \frac{\mu_{\max} S}{K_{\mu} + S} \quad (2)$$

where S is nutrient concentration, μ_{\max} is the maximal specific growth rate, and K_{μ} is the half-saturation constant; and a modified Monod model with threshold concentration nutrient concentration (S_T) required for positive growth rate (Istvánovics et al. 2000):

$$\mu = \frac{\mu_{\max} (S - S_T)}{K_{\mu} + S - S_T} \quad (3)$$

These kinetic models were fitted with nonlinear least-squares regression, taking as independent variable the average of the target P concentration corrected for carryover from the preconditioning culture and the measured SRP concentration on day 4. The modified Monod model (Eq. 3) was fitted for all experiments, except for experiments in which negative estimates of the threshold S_T were obtained, in which case, the conventional Monod model (Eq. 2) was fitted.

Results

Nutrient-sufficient experiment Specific growth rate (μ) showed a unimodal function of temperature and an increasing function of salinity (Fig. 1). Asymmetry of the temperature response was represented by transforming temperature according to Eq. 1 with parameter $\theta = 0.7$. After conducting the best subsets regression analysis, a predictive model for μ was selected with five terms, including all linear and quadratic terms for temperature and salinity, and a temperature-salinity interaction:

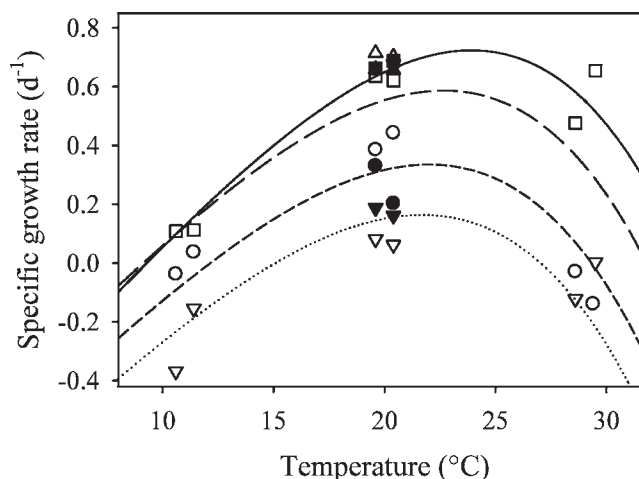


Fig. 1. Specific growth rate of *P. parvum* in the nutrient sufficient experiment. Symbols show growth rate under different salinity and ion composition: Triangles = $0.5\ g\ L^{-1}$; circles = $1.0\ g\ L^{-1}$; squares = $4\ g\ L^{-1}$. Open symbols = ASW medium; closed symbols = ALW medium. Curves show the fitted regression model (Eq. 4) for different salinities: solid curve = $4\ g\ L^{-1}$; long dashed curve = $2\ g\ L^{-1}$; short dashed curve = $1\ g\ L^{-1}$; dotted curve = $0.5\ g\ L^{-1}$.

$$\begin{aligned} \mu = & -3.531 + 0.02534(\sigma - 1.833) - 0.06311(\sigma - 1.833)^2 \\ & + 7.468 \exp \left[0.7 \left(\frac{T - 20}{20} \right) \right] \\ & - 3.414 \exp \left[1.4 \left(\frac{T - 20}{20} \right) \right] \\ & + 0.1697(\sigma - 1.833) \exp \left[0.7 \left(\frac{T - 20}{20} \right) \right] \end{aligned} \quad (4)$$

where σ is salinity ($g\ L^{-1}$), and T is temperature ($^{\circ}C$). The predictive model fit well ($R^2 = 0.901$) and was significant ($F_{5,18} = 32.5$, $p < 0.001$). Terms not included in the predictive model involved ion composition and its interaction with salinity and were not statistically significant (partial F -tests, $df = 1, 15$, $p > 0.3$). Terms included in the predictive model were statistically significant (partial F -tests, $df = 1, 18$, $p < 0.01$) with two exceptions: the linear salinity term (partial F -test, $df = 1, 18$, $p = 0.71$) was included because the marginal quadratic salinity term (partial F -test, $df = 1, 18$, $p = 0.052$) was also included. Eliminating the quadratic salinity term produced residual plots that strongly suggested curvature in the response to salinity, so the term was retained. The highest predicted μ from Eq. 4 was $0.72\ d^{-1}$ at a temperature of $24^{\circ}C$ and salinity of $4\ g\ L^{-1}$, the upper salinity limit for applicability of this model.

Using 48-h static bioassays to assess acute toxicity to *P. promelas*, only samples from cultures with salinities of 4 or $17.8\ g\ L^{-1}$, grown at $20^{\circ}C$, were toxic. Other cultures were not detectably toxic (i.e., survival of fish in 100% sample water did not differ from survival in control water). Cultures that were toxic to fish had significantly higher (t -test, $t = 9.98$, $df = 26$, $p < 0.001$) average stationary cell

Table 3. Cell quotas and stoichiometry from P limited preconditioning cultures of *P. parvum*. Cultures were grown under the indicated temperature, salinity, and ion composition (ASW = artificial seawater; ALW = artificial lake water). Ranges are given for duplicate cultures, except where the asterisk (*) indicates a single culture.

Temperature (°C)	Salinity (g L ⁻¹)	Ion composition	P quota (range, fmol cell ⁻¹)	Cellular C:P (range)	Cellular N:P (range)
10	1	ASW	335–341	69–81	1.3–1.4
10	1	ALW	82*	1001*	26*
10	3	ASW	447–481	103–121	5.1–5.9
10	3	ALW	246–268	98–121	6.0–6.5
20	1	ASW	288–298	71–95	4.5–5.2
20	1	ALW	15–17	152–168	17–19
20	3	ASW	6.7–6.8	457–458	39–40
20	3	ALW	3.7–4.3	520–588	44–45

concentration of *P. parvum* than those that were not detectably toxic ($5.0 \times 10^5 \pm 1.5 \times 10^5$ cells mL⁻¹ for toxic cultures, $3.8 \times 10^4 \pm 9.1 \times 10^4$ cells mL⁻¹ for nontoxic cultures, mean \pm SD). For many cultures not detectably toxic, stationary cell concentrations of *P. parvum* were below the LC₅₀ cell concentrations of toxic cultures, which ranged from 2.2 to 6.7×10^4 cells mL⁻¹ (Table 2). Toxic cultures also had significantly higher (*t*-test, *t* = 5.43, *df* = 26, *p* < 0.001) pH than those that were not detectably toxic (9.5 ± 0.41 for toxic cultures, 7.5 ± 0.97 for nontoxic cultures). For toxic cultures, LC₅₀ was not significantly related to salinity, ion composition, or their interaction (ANOVA, *F*-tests, *df* = 1, 4, *p* > 0.5).

Nutrient-limited experiments Preconditioning cultures were intended to reduce cellular P storage in *P. parvum* populations prior to inoculation into experimental cultures for determination of P-limited growth kinetics. After successful preconditioning, the cell quota of P can be interpreted as the minimal quota at which the population growth rate goes to zero (Grover 1989). Data on P quotas and cellular stoichiometry suggest that successful reduction of P storage occurred under some conditions but not others (Table 3). Cell quotas of P were less than 20 fmol cell⁻¹ for three sets of preconditioning cultures (Table 3), and all of these cultures had cellular C:P and N:P ratios exceeding the Redfield ratios of 106 and 16, respectively. Cell quota was somewhat higher at 82 fmol cell⁻¹ in the unreplicated preconditioning culture at 10°C, 1 g L⁻¹ salinity, and

ALW medium, but both cellular C:P and N:P ratios exceeded the Redfield ratios. These results suggest successful reduction of stored P by preconditioning in these four cases, and they suggest that the minimal P quota for *P. parvum* can approach about 4 fmol cell⁻¹. For all other experimental conditions, cell quotas of P in preconditioning cultures exceeded 200 fmol cell⁻¹, and cellular C:P and N:P ratios ranged from lower than the Redfield ratios to slightly higher. These results suggest that preconditioning did not successfully reduce stored P in these four cases.

For two experiments, parameter estimates for K_μ and S_T were not biologically meaningful, i.e., estimates were negative. These cases occurred at 10°C and salinities of 1 and 3 g L⁻¹ in ASW medium. In the remaining experiments, biologically meaningful parameter estimates were obtained (Table 4; Fig. 2). In three cases, estimates of S_T were positive. Otherwise, estimates of S_T were negative, so Eq. 2 was fitted.

Estimates of μ_{\max} increased with temperature and salinity (Table 4), although they were not well predicted by regression Eq. 4 as developed from the nutrient-sufficient experiment. With one exception, estimates of K_μ and S_T were low, indicating that P-dependent growth was saturated at concentrations lower than about 0.05 $\mu\text{mol L}^{-1}$. In general, estimates of K_μ were higher for growth in ASW medium than in ALW medium. For cultures grown at 20°C and 1 g L⁻¹ salinity in ASW medium, the estimated K_μ approached 0.5 $\mu\text{mol L}^{-1}$.

Table 4. Summary of nonlinear regression fit of all nutrient kinetics experiments. Cultures were grown under the indicated temperature, salinity, and ion composition (ASW = artificial seawater; ALW = artificial lake water). Maximal growth rate (μ_{\max}), half saturation constant (K_μ), and threshold (S_T) estimates are from nonlinear regressions.

Growth conditions			Parameter (estimate \pm SE)		
Temperature (°C)	Salinity (g L ⁻¹)	Ion composition	μ_{\max} (d ⁻¹)	K_μ ($\mu\text{mol L}^{-1}$)	S_T ($\mu\text{mol L}^{-1}$)
10	1	ALW	0.21 \pm 0.057	0.022 \pm 0.031	N/A
10	3	ALW	0.21 \pm 0.056	0.0055 \pm 0.0129	0.0011 \pm 0.0071
20	1	ASW	0.28 \pm 0.079	0.47 \pm 0.342	0.13 \pm 0.00276
20	1	ALW	0.11 \pm 0.047	0.0026 \pm 0.0051	0.0016 \pm 0.0031
20	3	ASW	0.35 \pm 0.058	0.024 \pm 0.025	N/A
20	3	ALW	0.56 \pm 0.040	0.0032 \pm 0.0019	N/A
20	4	ASW	0.84 \pm 0.048	0.013 \pm 0.0046	N/A

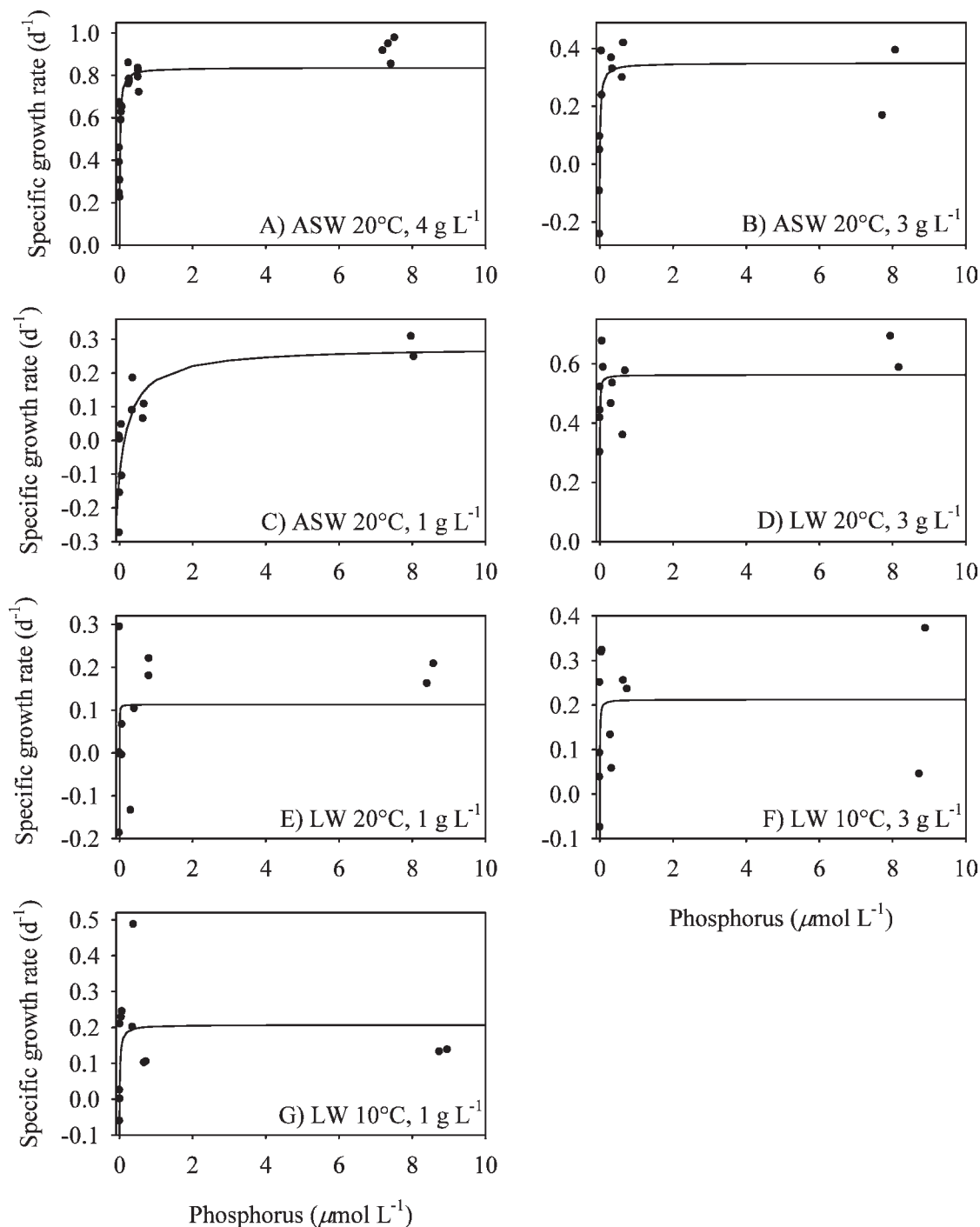


Fig. 2. Specific growth rates of *P. parvum* in nutrient limited experiments. Curves show the fitted kinetic model (Eq. 2 or 3), the parameters of which are given in Table 4.

Discussion

Species that become abundant where previously unnoticed, including invasive species, likely encounter conditions at the edge of their niche. Traditionally, however, ecophysiological studies have measured growth at near optimal conditions, or over broad ranges that do not focus on the edge of the niche. This study focused on the growth performance of the harmful alga *Prymnesium parvum* at the

low-salinity edge of its niche. For the strain studied here, a previous study estimated an optimal salinity for specific growth rate of 22 g L⁻¹ (Baker et al. 2007), and studies of other strains suggest optimal growth at salinities of 8–34 g L⁻¹ (Larsen et al. 1993; Larsen and Bryant 1998). Here, specific growth rate was found to decrease strongly as salinity decreased from 4 to 0.5 g L⁻¹. A lower limit of salinity for population increase appears to lie between 0.5 and 1 g L⁻¹. In the range of 1–2 g L⁻¹, characterizing

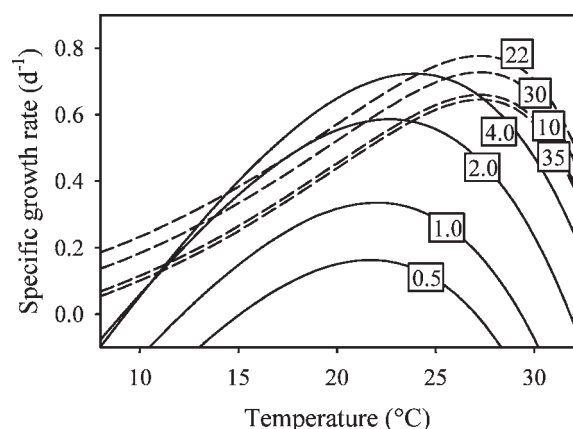


Fig. 3. Comparison of the regression model for specific growth rate fitted to the nutrient sufficient experiment (Eq. 4, solid curves) with a previous model fitted to specific growth rate in a similar experiment at a higher salinity range (Baker et al. 2007, dashed curves). Numbers in the boxes are the salinity (g L^{-1}) for each curve.

many of the brackish inland waters in the southwestern United States where *P. parvum* has recently been problematic, rates of population growth reached a modest range of $0.1\text{--}0.3\text{ d}^{-1}$.

Previous studies of *P. parvum* at higher salinities suggest a relatively high optimum temperature for population growth, estimated to be 27°C for the strain used in this study (Baker et al. 2007) and $15\text{--}30^{\circ}\text{C}$ for other strains (Larsen et al. 1993; Larsen and Bryant 1998). For growth of this strain at higher salinities, Baker et al. (2007) derived a regression function similar to Eq. 4. A comparison of these two regressions (Fig. 3) suggests that low salinity reduces the growth of *P. parvum* to a greater extent at high temperatures than at low temperatures. Thus, the optimum temperature for growth apparently decreases as salinity decreases, reflecting a statistically significant interaction of temperature and salinity. Optimal temperatures for growth approaching 30°C found in other studies at salinities greater than 4 g L^{-1} are hard to reconcile with the tendency for *P. parvum* to bloom during cooler weather in Texas and other parts of the southwestern United States. The salinity temperature interaction found here shifts the optimum temperature for growth at salinities of $1\text{--}2\text{ g L}^{-1}$, perhaps making blooms less likely during warm weather in this region and more likely in cooler weather.

The growth performance of *P. parvum* at low-P concentration might also contribute to bloom formation in inland waters. Though extensive studies of nutrient limitation in most Texas lakes affected by *P. parvum* have not been done, nearby lakes are often but not continually P-limited (Grover et al. 1999; Grover and Chrzanowski 2004). The nutrient-saturated, maximal growth rates of *P. parvum* are modest compared to many other algal species grown at similar temperatures (Tilman et al. 1982; Grover 1989; Grover et al. 1999), but growth near maximal is maintained at low-P concentrations under some conditions (Table 4; Fig. 2). In particular, P concentrations permitting half the maximum growth rate (i.e., the sum $K_{\mu} + S_T$) range

from 0.003 to $0.007\text{ }\mu\text{mol L}^{-1}$ when *P. parvum* is grown under low-salinity conditions in ALW medium that mimics the ion composition of inland waters. Half-saturation concentrations found here for *P. parvum* are similar to those for diatoms and green algae identified as having high competitive ability for P (Tilman et al. 1982; Grover 1989), and they are lower than those of some diatoms, green algae, and cyanobacteria found in Texas lakes (Grover et al. 1999). High competitive ability under P limitation is consistent with high expression of putative phosphate transporter genes in *P. parvum* (La Claire 2006).

High competitive ability for P by *P. parvum* appears to be enhanced by the ion composition of brackish inland waters, which are rich in divalent cations and bicarbonate compared to seawater. When *P. parvum* is grown under low salinity with the ion composition of seawater, $K_{\mu} + S_T$ values exceed $0.01\text{ }\mu\text{mol L}^{-1}$. Thus, *P. parvum* appears to be physiologically pre-adapted to invade P-limited brackish inland waters. Few other studies have examined the influence of salinity and ion composition on nutrient-limited growth kinetics of algae. For three diatom species studied, salinity and ion composition had species-specific influences on nitrate- and ammonium-limited growth kinetics (Saros and Fritz 2000). Given the widespread occurrence of brackish and saline inland waters in arid and semiarid climates, similar information would be helpful for other algae occurring in such regions.

The nutrient-limited experiments relied on a preconditioning phase to reduce cellular P storage. Based on P quotas and stoichiometry, preconditioning was successful in four cases and unsuccessful in another four. All of the unsuccessful cases involved either low temperature or low salinity, at which growth was so slow that the anticipated P depletion did not occur. Such failure of preconditioning is an inherent risk of examining growth under suboptimal conditions. For two cases of unsuccessful preconditioning, no estimates of growth kinetic parameters were obtained due to high variability of specific growth rates. For another case of unsuccessful preconditioning (growth at 20°C , 1 g L^{-1} salinity in ASW medium), the estimated value of $K_{\mu} + S_T$ far exceeded all other such estimates (Table 4) and probably is unreliable. For the last case of unsuccessful preconditioning (growth at 10°C , 3 g L^{-1} salinity in ALW medium), the estimated value of $K_{\mu} + S_T$ is within the range of estimates obtained when preconditioning was successful. For one final set of conditions (growth at 20°C , 4 g L^{-1} salinity in ASW medium), data on cellular P composition were not obtained, so the success of preconditioning cannot be evaluated, but the value of $K_{\mu} + S_T$ is within the range of estimates obtained when preconditioning was successful.

For the temperature and salinity ranges of $10\text{--}20^{\circ}\text{C}$ and $1\text{--}4\text{ g L}^{-1}$, the nutrient-sufficient experiment predicts that specific growth rate increases with both of these factors. Qualitatively, estimates of the maximal growth rate μ_{max} from nutrient-limited experiments agree with this prediction. Quantitatively, however, estimates of μ_{max} consistently exceed the predictions of the regression Eq. 4 developed from the nutrient-sufficient experiment. Preconditioning may be responsible for this difference. Inocula for the nutrient-sufficient experiment were taken directly from stock

cultures grown at 20°C and 5.8 g L⁻¹ in ASW or ALW media without preconditioning, and thus they experienced shifts in temperature and salinity at the start of the experimental incubations. Inocula for the nutrient-limited experiment were preconditioned by extended growth under the experimental temperature and salinity conditions. The fact that higher nutrient-saturated growth rates were apparently produced by preconditioning suggests that *P. parvum* might acclimate to suboptimal conditions over several generations. Such acclimation deserves further study, and it could enhance the capability of this species to form blooms under suboptimal growth conditions.

Toxicity of *P. parvum* is associated with nutrient limitation (Johansson and Granéli 1999; Granéli and Johansson 2003), and for the strain studied here, growth under suboptimal temperature and salinity previously led to enhanced toxicity (Baker et al. 2007). In the current study, toxicity to fish was detected only at salinities of 4 g L⁻¹ or higher. Populations cultured at lower salinities were not detectably toxic. The low abundance of most nontoxic cultures might explain such lack of toxicity. Most (75%) of the nontoxic cultures had cell concentrations below 2.2×10^4 cells mL⁻¹, the lowest LC₅₀ estimated from bioassays of acute toxicity to fish, and many (40%) of the nontoxic cultures had much lower cell concentrations of <1000 cells mL⁻¹. Even if cells of *P. parvum* were actively producing toxins, sparse populations might not accumulate enough toxins to cause mortality of fish during short-term bioassays. On the other hand, two nontoxic cultures had cell concentrations exceeding 10^5 cells mL⁻¹. Dense populations of *P. parvum* with little or no toxicity have been observed in field experiments and lake monitoring (D. L. Roelke unpubl.; Schwierzke et al. in press). Together, these observations suggest that high abundance is a necessary but not sufficient condition for fish-kills to occur, and that regulation of toxin production also plays a role. These observations also suggest that toxin production and allelopathy are not necessary for high abundance, i.e., blooms, to occur.

The P-limited growth kinetics found here imply that only a severe depletion of P would reduce the potential for blooms to occur. Perhaps somewhat paradoxically, available evidence suggests that since specific growth of *P. parvum* becomes saturated at low-P concentrations, nutrient additions might often do little to increase its population growth, while reducing toxicity (Johansson and Granéli 1999; Granéli and Johansson 2003), and even reducing bloom initiation by stimulating competitors (Roelke et al. 2007; Errera et al. 2008).

As expected, growth performance is reduced at the low-salinity edge of the niche for *P. parvum*. Nevertheless, under many low-salinity conditions, its specific growth rate is sufficient to produce blooms that are toxic to fish. Blooms of *P. parvum* in the southwestern United States occur at water temperatures of 10–20°C and salinities of 1–2 g L⁻¹ (Roelke et al. 2007; L. Schwierzke unpubl.), where a growth rate of 0.1–0.3 d⁻¹ can be expected. A bloom population of 4×10^4 cells mL⁻¹ (L. Schwierzke unpubl.) can thus be reached from a background population of 10^2 cells mL⁻¹ in as little as 20 d, if population losses are

negligible. Predictions of growth rates can be constructed by using Eq. 4 to describe the maximal growth rate (μ_{\max}) of *P. parvum* as a function of temperature and salinity, multiplied by a saturation term derived from Eq. 2 to describe phosphorus-limitation. This is a standard representation of algal growth in water-quality models (Chapra 1997). The resulting growth equations provide a reasonable model for short-term dynamics within a single bloom (D. L. Roelke et al. unpubl.). A longer-term model of annual dynamics incorporating several other processes was less successful when compared to observations in one lake (Grover et al. in press).

Ecologists often characterize growth performance under conditions close to optimal for the species they study. As a practical matter, growth rates are lower and more variable as the edge of the niche is approached, making their measurement difficult. However, there may also be an implicit view that species will most likely be abundant under conditions near the center of their niche; that is, that the fundamental and realized niches (Hutchinson 1958) do not differ much. For *P. parvum*, the realized niche where it occurs in brackish inland waters appears to lie along the edge of the fundamental niche, possibly as a result of its competitors (Roelke et al. in press) or natural enemies (Schwierzke et al. in press). Similarly, the tropical cyanobacterium *Cylindrospermopsis raciborskii* appears to be invading inland waters at midlatitudes along the low-temperature edge of its niche (Briand et al. 2004; Wiedner et al. 2007). Growth at the edge of the fundamental niche might be relevant more generally for other invasive and nuisance species, especially given global changes in climate, hydrology, and nutrient loading.

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References

- APHA. 1998. Standard methods for the examination of water and wastewater, 20th ed. American Public Health Assoc.
- BAKER, J. W., J. P. GROVER, B. W. BROOKS, F. UREÑA BOECK, D. L. ROELKE, R. ERRERA, AND R. L. KIESLING. 2007. Growth and toxicity of *Prymnesium parvum* (Haptophyta) as a function of salinity, light and temperature. *J. Phycol.* **43**: 219–227.
- BRIAND, J. F., C. LEBOULANGER, J. F. HUMBERT, C. BERNARD, AND P. DUFOUR. 2004. *Cylindrospermopsis raciborskii* (cyanobacteria) invasion at mid latitudes: Selection, wide physiological tolerance, or global warming? *J. Phycol.* **40**: 231–238.
- CHAPRA, S. C. 1997. Surface water quality modeling. McGraw Hill.
- EDVARDSEN, B., AND E. PAASCHE. 1998. Bloom dynamics and physiology of *Prymnesium* and *Chrysochromulina*, p. 193–208. In D. M. Anderson, A. D. Cembella and G. M. Hallegraeff [eds.], *The physiological ecology of harmful algal blooms*. Springer.
- ERRERA, R. M., D. L. ROELKE, R. L. KIESLING, B. W. BROOKS, J. P. GROVER, L. SCHWIERZKE, F. UREÑA BOECK, J. W. BAKER, AND J. L. PINCKNEY. 2008. Effect of imbalanced nutrients and

- immigration on *Prymnesium parvum* community dominance and toxicity: Results from in lake microcosm experiments. *Aquat. Microb. Ecol.* **52**: 33–44.
- FINNEY, D. J. 1971. Probit analysis, 3rd ed. Cambridge Univ. Press.
- GRANÉLI, E., AND N. JOHANSSON. 2003. Effects of the toxic haptophyte *Prymnesium parvum* on the survival and feeding of a ciliate: The influence of different nutrient conditions. *Mar. Ecol. Prog. Ser.* **254**: 49–56.
- GROVER, J. P. 1989. Phosphorus dependent growth kinetics of 11 species of freshwater algae. *Limnol. Oceanogr.* **34**: 339–346.
- _____, J. W. BAKER, D. L. ROELKE, AND B. W. BROOKS. In press. Current status of mathematical models for population dynamics of *Prymnesium parvum* in a Texas reservoir. *J. Am. Water Resour. Assoc.*
- _____, F. UREÑA BOECK, B. W. BROOKS, R. M. ERRERA, D. L. ROELKE, AND R. L. KIESLING. 2007. Laboratory tests of ammonium and barley straw extract as agents to suppress abundance of the harmful alga *Prymnesium parvum* and its toxicity to fish. *Water Res.* **41**: 2503–2512.
- _____, AND T. H. CHRZANOWSKI. 2004. Limiting resources, disturbance, and diversity in phytoplankton communities. *Ecol. Monogr.* **74**: 533–551.
- _____, R. W. STERNER, AND J. L. ROBINSON. 1999. Algal growth in warm temperate reservoirs: Nutrient dependent kinetics of individual taxa and seasonal patterns of dominance. *Arch. Hydrobiol.* **145**: 1–23.
- HALLEGRAEFF, G. M. 1993. A review of harmful algal blooms and their apparent global increase. *Phycologia* **32**: 79–99.
- HAMILTON, M. A., R. L. RUSSO, AND R. V. THURSTON. 1977. Trimmed Spearman Karber method for estimating median lethal concentrations. *Environ. Sci. Tech.* **11**: 714–719.
- HOBBIE, J. E., R. J. DALEY, AND S. JASPER. 1977. Use of nucleopore filters for counting bacteria by fluorescence microscopy. *Appl. Environ. Microbiol.* **33**: 1225–1228.
- HUTCHINSON, G. E. 1958. Concluding remarks. *Cold Spring Harbor Symp. Quant. Biol.* **22**: 415–427.
- ISTVÁNOVICS, V., H. M. SHAFIK, M. PRESING, AND S. JUHOS. 2000. Growth and phosphate uptake kinetics of the cyanobacterium *Cylindrospermopsis raciborskii* (Cyanophyceae) in through flow cultures. *Freshwat. Biol.* **43**: 257–275.
- JAMES, T. L., AND A. DE LA CRUZ. 1989. *Prymnesium parvum* Carter (Chrysophyceae) as a suspect of mass mortalities of fish and shellfish communities in western Texas. *Texas J. Sci.* **41**: 429–430.
- JOHANSSON, N., AND E. GRANÉLI. 1999. Influence of different nutrient conditions on cell density, chemical composition and toxicity of *Prymnesium parvum* (Haptophyta) in semi continuous cultures. *J. Exp. Mar. Biol. Ecol.* **239**: 243–258.
- KESTER, D. R., I. W. DUEDELL, D. N. CONNORS, AND R. M. PYTKOWICZ. 1967. Preparation of artificial seawater. *Limnol. Oceanogr.* **12**: 176–179.
- KLEINBAUM, D. G., L. L. KUPPER, K. E. MULLER, AND A. NIZAM. 1998. Applied regression analysis and other multivariable methods, 3rd ed. Duxbury Press.
- LA CLAIR, J. W., III. 2006. Analysis of expressed sequence tags from the harmful alga, *Prymnesium parvum* (Prymnesiophyceae, Haptophyta). *Mar. Biotech.* **8**: 534–546.
- LARSEN, A., AND S. BRYANT. 1998. Growth rate and toxicity of *Prymnesium parvum* and *Prymnesium patelliferum* (Haptophyta) in response to changes in salinity, light and temperature. *Sarsia* **83**: 409–418.
- _____, W. EIKREM, AND E. PAASCHE. 1993. Growth and toxicity in *Prymnesium patelliferum* (Prymnesiophyceae) isolated from Norwegian waters. *Can. J. Bot.* **71**: 1357–1362.
- MACLACHLAN, J. 1973. Growth media—marine, p. 25–51. In J. R. Stein [ed.], *Handbook of phycological methods*. Cambridge Univ. Press.
- MARGALEF, R. 1969. Counting, p. 7–14. In R. A. Vollenweider [ed.], *A manual on methods for measuring primary production in aquatic environments*. IBP Handbook 12. Blackwell.
- MENZEL, D. W., AND N. CORWIN. 1965. The measurement of total phosphorus in seawater based on the liberation of organically bound fractions by persulfate oxidation. *Limnol. Oceanogr.* **10**: 280–282.
- RHEE, G. Y. 1982. Effects of environmental factors and their interactions on phytoplankton growth. *Adv. Microb. Ecol.* **6**: 33–74.
- ROELKE, D. L., R. M. ERRERA, R. KIESLING, B. W. BROOKS, J. P. GROVER, L. SCHWIERZKE, F. UREÑA BOECK, J. BAKER, AND J. L. PINCKNEY. 2007. Effects of nutrient enrichment on *Prymnesium parvum* population dynamics and toxicity: Results from field experiments, Lake Possum Kingdom, USA. *Aquat. Microb. Ecol.* **46**: 125–140.
- _____, L. SCHWIERZKE, B. W. BROOKS, J. P. GROVER, R. M. ERRERA, T. W. VALENTI, JR., AND J. L. PINCKNEY. In press. Factors influencing *Prymnesium parvum* population dynamics during bloom initiation: Results from in lake mesocosm experiments. *J. Am. Water Resour. Assoc.*
- SAROS, J. E., AND S. C. FRITZ. 2000. Changes in the growth rates of saline lake diatoms in response to variation in salinity, brine type and nitrogen form. *J. Plankton Res.* **22**: 1071–1083.
- SCHWIERZKE, L., D. L. ROELKE, B. W. BROOKS, J. P. GROVER, T. W. VALENTI, JR., M. LAHOUSSE, C. J. MILLER, AND J. L. PINCKNEY. In press. *Prymnesium parvum* population dynamics during bloom development: a role assessment of grazers and virus. *J. Am. Water Resour. Assoc.*
- STRICKLAND, J. D. H., AND T. R. PARSONS. 1972. A practical handbook of seawater analysis, 2nd ed. *Bull. Fish. Res. Bd. Can.* **167**: 1–310.
- SUNDA, W. G., E. GRANÉLI, AND C. J. GOBLER. 2006. Positive feedback and the development and persistence of ecosystem disruptive algal blooms. *J. Phycol.* **42**: 963–974.
- THRONDSSEN, J. 1978. Preservation and storage, p. 70–17. In A. Sournia [ed.], *Phytoplankton manual*. Monographs on oceanographic methodology. UNESCO.
- TILMAN, D., AND S. S. KILHAM. 1976. Phosphate and silicate growth and uptake kinetics of the diatoms *Asterionella formosa* and *Cyclotella meneghiniana* in batch and semicontinuous culture. *J. Phycol.* **12**: 375–383.
- _____, AND P. KILHAM. 1982. Phytoplankton community ecology: The role of limiting nutrients. *Ann. Rev. Ecol. Syst.* **13**: 349–372.
- USEPA. 2002. Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms, 5th ed. Document EPA/821/R-02/012. U.S. Environmental Protection Agency.
- WIEDNER, C., J. RUCKER, R. BRUGGEMAN, AND B. NIXDORF. 2007. Climate change affects timing and size of populations of an invasive cyanobacterium in temperate regions. *Oecologia* **152**: 473–484.

Associate editor: Anthony Larkum

Received: 26 July 2008

Accepted: 22 April 2009

Amended: 21 May 2009

Kevin Minoli/DC/USEPA/US
12/20/2010 04:31 PM

To: Matthew Klasen
cc
bcc
Subject: Fw: HW comments 1-242 -- first crack at trying to figure out best person/office for response

----- Forwarded by Kevin Minoli/DC/USEPA/US on 12/20/2010 04:31 PM -----

From: Stefania Shamet/R3/USEPA/US
To: Palmer Hough/DC/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA
Date: 12/20/2010 01:55 PM
Subject: HW comments 1-242 -- first crack at trying to figure out best person/office for response

Here's 1-242. I understand from Palmer that he will take care of 243-end.

It's in 2 docs because I'm working off what we got last week.

All comments that need response are in yellow with a person or office in the front. So you just need to scroll through and look for yellow.

Haven't had time to count them and need to turn to R4 and NPDES now.



Hunton-Williams Comments_1-68SDSCOMPARE.doc



Hunton-Williams Comments_69-242.docx

ATTACHMENT REDACTED - DELIBERATIVE

John Forren/R3/USEPA/US

12/20/2010 04:55 PM

To David Rider

cc

bcc

Subject Fw: HW comments 1-242 -- first crack at trying to figure out best person/office for response

Dave:

Please take a look at the attachments. There are a couple places where Stef thought you might be able to help out. There may be some other areas dealing with selenium that you could help out with too. In any case, any help would be very much appreciated.

We're having a conference call tomorrow morning at 8:00 am with HQ to going over these comments.

Thanks.

John

----- Forwarded by John Forren/R3/USEPA/US on 12/20/2010 04:53 PM -----

From: Palmer Hough/DC/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EPA
Cc: John Forren/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA
Date: 12/20/2010 04:43 PM
Subject: Fw: HW comments 1-242 -- first crack at trying to figure out best person/office for response

FYI:

For those that did not get this already. This is Stef's thoughts on who would be best to respond to "new" comments from 1-242.

I'm working on 242 to 301

-Palmer

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

----- Forwarded by Palmer Hough/DC/USEPA/US on 12/20/2010 04:40 PM -----

From: Stefania Shamet/R3/USEPA/US
To: Palmer Hough/DC/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Kevin

Date: Minoli/DC/USEPA/US@EPA
12/20/2010 01:55 PM
Subject: HW comments 1-242 -- first crack at trying to figure out best person/office for response

Here's 1-242. I understand from Palmer that he will take care of 243-end.

It's in 2 docs because I'm working off what we got last week.

All comments that need response are in yellow with a person or office in the front. So you just need to scroll through and look for yellow.

Haven't had time to count them and need to turn to R4 and NPDES now.



Hunton-Williams Comments_1-68SDSCOMPARE.doc



Hunton-Williams Comments_69-242.docx

ATTACHMENTS REDACTED - DELIBERATIVE

Palmer Hough/DC/USEPA/US

To Ross Geredien

12/20/2010 06:14 PM

cc Christopher Hunter

bcc

Subject Re: 7 comments from 242 - 301 that need responses

Thanks Ross:

I added this to the right place in App. 3: (Hambright, 2010; Roelke, 2010; Baker, 2009; and Sager, 2008).

Do you think it needs to go anywhere else?

-palmer

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

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Ross Geredien

(b) (5)

12/20/2010 04:22:40 PM

From: Ross Geredien/DC/USEPA/US
To: Palmer Hough/DC/USEPA/US@EPA
Date: 12/20/2010 04:22 PM
Subject: Re: 7 comments from 242 - 301 that need responses

(b) (5)

Ross

Ross Geredien
ORISE Fellow
EPA Office of Wetlands, Oceans, and Watersheds
202-566-1466
[Geredien.ross\(AT\)epa.gov](mailto:Geredien.ross(AT)epa.gov)

Palmer Hough

245c. The post-mined environment creates "se...

12/20/2010 03:57:05 PM

From: Palmer Hough/DC/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA
Cc: Ross Geredien/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA
Date: 12/20/2010 03:57 PM
Subject: 7 comments from 242 - 301 that need responses

245c. The post-mined environment creates “severely altered conditions in stream courses that are not destroyed by valley fills,” including “[a]ltered hydrograph with new flow regimes that markedly depart from that under which the streams have evolved” and “[a]ltered timing, temperature and chemical composition of post-mine discharges of water to receiving streams.” *Id.* at 70;

(b) (5)

245d. Some of the regulatory definitions of ephemeral, intermittent and perennial streams “are based on arbitrary watershed areas or flow cutoffs.” RD App. 3 at 1;

(b) (5)

262 EPA relies on the 2003 Paybins paper as the basis for its determination that the mitigation provided for in this permit is based on a misclassification of stream resources, contending that the Paybins paper advocates the use of drainage area as the sole basis for determining perennial and intermittent streams. RD App. 3 at 3-5. However, the Paybins study used by EPA does not support EPA’s contention. The study was conducted over a limited time period and with some inherent error given the data collection and analysis techniques. TED2 § 5.2. The Paybins study does shed light on the inherent variability of first-order watersheds, but does not justify a definition of perennial or intermittent streams based exclusively on the drainage area acreages utilized by EPA. *Id.* In fact, the author acknowledges “the local conditions for small headwater basins are extremely variable, and relations of these conditions to intermittent and perennial points could not be defined within this limited study.” K.S. Paybins, *Flow Origin, Drainage Area, and Hydrologic Characteristics for Headwater Streams in the Mountaintop Coal-Mining Region of Southern West Virginia, 2000-01* at 18, Water Resources Investigation Rpt. 02-4300, U.S. Geological Survey, Charleston, WV (2003), *available at* <http://pubs.usgs.gov/wri/wri02-4300/pdf/wri02-4300.book.pdf>. Thus, Paybins is a limited study which does not support a redefinition of stream classifications based exclusively on drainage area acreage.

282 Green and Gingerich do not support EPA’s conclusion that all created water bodies in mined areas will exceed water quality standards. The Green study evaluated a single erosion channel under conditions that are not representative of the mitigation requirements applicable to the Spruce No. 1 Mine. TED2 § 5.3. The Kirk study and the Gingerich thesis actually support the view that erosion control ditches can provide effective water quality and habitat functions and result in taxa abundance and diversity that support a balanced aquatic community. *Id.* As explained above, the Kirk study finds that erosion control channels perform an excellent job at removing water contaminants and provide aquatic habitats with abundant insects, amphibians, reptiles, and potentially even fish. The Gingerich thesis notes that there can be a macroinvertebrate and amphibian species shift in erosion control channels, but the abundance and richness of these species remains similar between erosion control channels and reference cites—a condition that supports a balanced aquatic community. *Id.*

(b) (5)

283 The examples given by EPA as the basis for its concerns about erosion control channels do not predict conditions at the Spruce No. 1 Mine. RD App. 3 at 6-8. For example,

the mean conductivity for the Gingerich data is over 2000 iS/cm and the mean conductivity for the Green data is 2200 iS/cm, both of which are almost triple the worst case average projected by EPA in its conductivity analysis for the Spruce No. 1 site. RD at 51. EPA's examples are inapposite to the stream mitigation required by the Spruce permit because the WVSCI scores are so low at EPA's example sites that, were they to occur at the Spruce No. 1 site, the mitigation would fail the stringent performance criteria and remedial action or alternative mitigation would be required. Thus, the data cited by EPA is neither relevant to the wetland stream creation proposed for Spruce No.1 Mine nor to the permit conditions applicable to Mingo Logan's entire mitigation program.

284 EPA contends that erosion control channels "should be considered sources of pollution rather than a mitigation feature" because "[d]ata show that water quality in sediment ditches in previously mined areas is highly degraded." RD App. 3 at 6. However, aside from the fact that EPA's examples are inapposite, EPA has failed to account for the legal requirements applicable to these erosion control channels. Under the Spruce No. 1 Mine permit issued by WVDEP, these erosion control channels cannot be utilized as mitigation structures until they are released from SMCRA regulation. Under Mingo Logan's SMCRA permit, before the channels are released, they must meet all applicable Section 402 effluent limitations without treatment. Thus, contrary to EPA's assertion, the water quality in the erosion control channels will not be highly degraded because the channels must comply with EPA's own effluent limitations before they will be used as mitigation features.

297 EPA also claims that the connectivity channels provided for in the Spruce No. 1 Mine permit "are expected to have minimal function for [] water quality reasons." RD App. 3 at 11. However, as discussed in the section on erosion control channels, to comply with SMCRA, the water in the connectivity channels must be in compliance with all of the applicable effluent limitations without any prior treatment before they can be used as mitigation. Thus, due to the conditions of the SMCRA permit, the use of these connectivity channels for mitigation are expected to result in a functional stream from a water quality perspective.

(b) (5)

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Matthew
Klasen/DC/USEPA/US
12/20/2010 06:26 PM

To Gregory Peck
cc
bcc
Subject Draft note to Betsy Behl and Joe

TO: Betsy Behl/DC/USEPA/US, Joe Beaman/DC/USEPA/US,

CC: Palmer Hough/DC/USEPA/US, Brian Frazer/DC/USEPA/US, Christopher Hunter/DC/USEPA/US, Stefania Shamet/R3/USEPA/US, John Forren/R3/USEPA/US, Margaret Passmore/R3/USEPA/US, Matthew Klasen/DC/USEPA/US, Kevin Minoli/DC/USEPA/US, Karyn Wendelowski/DC/USEPA/US,

SUBJ: Assistance with selenium responses to Spruce comments

Betsy and Joe,

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Thanks,
Greg



2010-12-20 Potential OST Spruce comments.docx



Spruce FD draft 120110.doc



Appendix 4 Selenium 121010.doc



Appendix 2 Water Quality & Wildlife 121010.doc

ATTACHMENTS REDACTED - DELIBERATIVE

Matthew
Klasen/DC/USEPA/US
12/20/2010 06:40 PM

To Susan Cormier
cc Palmer Hough, Brian Frazer, Christopher Hunter, Stefania
Shamet, John Forren, Margaret Passmore, Kevin Minoli,
Karyn Wendelowski, Gregory Peck, Michael Slimak, Susan
Norton, Jeff Frithsen, Glenn Suter, Becki Clark
bcc
Subject Request for ORD help this week on Spruce response to
comments

Susan et al.:

Consistent with my note earlier today, we're working in OW, R3, and OGC to finish up a response to comments document on Spruce. Some of the questions pertain to conductivity in particular -- in many cases directly to the conductivity report, NMA's comments, and the SAB's review process.

Greg checked with Becki earlier today to see if we could enlist your help (if possible, given your schedule) to help with some of these responses, and she was OK with your participation if it's possible.

Attached are the issues we think you **may** be able to help with (**numbers 99a, 100a, 101a, 102a, 119a, 124a, 147a, 156a, 176a, 177a, and 178a**). Can you take a look and let us know if you might be able to help with answers to some of these?

For some of these, Stef in R3 made preliminary assignments to Wheeling, but I thought we might be able to reduce some of the number on Maggie's plate by passing along some that I thought ORD could help with.

I've also attached the draft Final Determination document on Spruce for reference (please do not circulate), as well as the conductivity-relevant appendices, so you have an idea of what's being commented on.

I'm happy to help explain this exercise tonight or tomorrow (anytime) if this seems like something you (or others -- maybe Sue or Glenn) could help us with. There's a quick turnaround, so getting draft technical answers this week is the goal.

Please let us know when you have a chance to review and when you get a sense to determine whether this is feasible. Thanks in advance for any help you can provide!

Thanks,
Matt



2010-12-20 Potential ORD Spruce comments.docx



Spruce FD draft 120110.doc



Appendix 1 Macroinvertebrates 121010.doc



Appendix 2 Water Quality & Wildlife 121010.doc

ATTACHMENTS REDACTED - DELIBERATIVE

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Stefania
Shamet/R3/USEPA/US
12/20/2010 07:53 PM

To: Brian Frazer
cc
bcc
Subject: Fw: HW comments 1-242 -- first crack at trying to figure out best person/office for response

Sorry, Brian. Was out doing the chauffeur/mom thing and just got your email

----- Forwarded by Stefania Shamet/R3/USEPA/US on 12/20/2010 07:53 PM -----

From: Kevin Minoli/DC/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA
Date: 12/20/2010 04:40 PM
Subject: Fw: HW comments 1-242 -- first crack at trying to figure out best person/office for response

----- Forwarded by Kevin Minoli/DC/USEPA/US on 12/20/2010 04:40 PM -----

From: Stefania Shamet/R3/USEPA/US
To: Palmer Hough/DC/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA
Date: 12/20/2010 01:55 PM
Subject: HW comments 1-242 -- first crack at trying to figure out best person/office for response

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Hunton-Williams Comments_1-68SDSCOMPARE.doc



Hunton-Williams Comments_69-242.docx

ATTACHMENTS REDACTED - DELIBERATIVE

Palmer Hough/DC/USEPA/US

To Christopher Hunter

12/21/2010 12:23 AM

cc

bcc

Subject Latest version of the draft FD - plan for Tuesday morning

Chris:

I hope you are rested up. We really missed you - I really missed you in particular.

I need to go home and pack now but I plan to be back in the office later this morning. (b) (5)

[REDACTED]

[REDACTED]

[REDACTED] I'm leaving the office at 3 pm to catch my flight - so it's important the you and I go over the FD ASAP today.

Welcome home!

-Palmer



ATTACHMENT REDACTED - DELIBERATIVE

Spill FD draft_working_v.doc

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

Wetlands Division
U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

Matthew
Klasen/DC/USEPA/US
12/21/2010 12:50 AM

To Christopher Hunter
cc Palmer Hough, Brian Frazer, Karyn Wendelowski, Kevin
Minoli, Gregory Peck
bcc
Subject Re: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices
1-5

Hi Chris,

(b) (5)



Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Christopher Hunter/DC/USEPA/US wrote: -----

To: Denise Keehner/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Cliff
Rader/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Kevin
Minoli/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Michael
Slimak/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, John
Pomponio/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Greg
Pond/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Christine
Mazzarella/R3/USEPA/US, Heather Case/DC/USEPA/US@EPA, Tom
Lavery/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA
From: Christopher Hunter/DC/USEPA/US
Date: 12/10/2010 06:15PM
Cc: Palmer Hough/DC/USEPA/US@EPA, Julia McCarthy/R8/USEPA/US@EPA, Marcel

Tchaou/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Jim Pendergast/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EP

Subject: FOR YOUR REVIEW: Draft Spruce 404(c) Appendices 1-5

Hello all,

As promised, attached for your review, please find the draft Appendices for the Spruce No. 1 Surface Mine 404(c) action. These are fairly technical, and I'm not expecting everyone to give me comments, but if you plan to review them, I am requesting **all comments (in redline/strikeout) back to me by COB December 20**. We are still finalizing the other 2 Appendices (Response to Comments and References). These will be reviewed by a smaller group within the next couple of weeks.

I will be out of the office until December 21, but if you have any questions on the draft during the next week, please contact Palmer Hough.

Thanks for your comments on the FD main text,
Chris

(See attached file: Appendix 1 Macroinvertebrates 121010.doc)(See attached file: Appendix 2 Water Quality & Wildlife 121010.doc) (See attached file: Appendix 3 Mitigation 121010.doc) (See attached file: Appendix 4 Selenium 121010.doc) (See attached file: Appendix 5 Cumulative Impacts 121010.doc)

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454
hunter.christopher@epa.gov

[attachment "Appendix 1 Macroinvertebrates 121010.doc" removed by Matthew Klasen/DC/USEPA/US]

[attachment "Appendix 2 Water Quality & Wildlife 121010.doc" removed by Matthew Klasen/DC/USEPA/US]

[attachment "Appendix 3 Mitigation 121010.doc" removed by Matthew Klasen/DC/USEPA/US]

[attachment "Appendix 4 Selenium 121010.doc" removed by Matthew Klasen/DC/USEPA/US]

[attachment "Appendix 5 Cumulative Impacts 121010.doc" removed by Matthew

Klasen/DC/USEPA/US]  - appendix 1 macroinvertebrates 121010 - mk.doc  - Appendix 2

Water Quality & Wildlife 121010 - mk.doc  - Appendix 3 Mitigation 121010 - mk.docx

ATTACHMENTS REDACTED - DELIBERATIVE

Matthew
Klasen/DC/USEPA/US
12/21/2010 07:25 AM

To Betsy Behl, Joe Beaman
cc Gregory Peck
bcc
Subject Re: Spruce Veto and Selenium

Betsy and Joe:

Thanks again for any help you can provide on this. To follow up from Greg's note, ORD folks -- to whom we've forwarded some of the conductivity questions -- asked for a sample of a couple existing answers to help structure their thinking about a response.

See attached for a couple draft answers from a previous round of comments on conductivity. We're trying to be at least this succinct this time around.

Thanks,
Matt



ATTACHMENT REDACTED - DELIBERATIVE

Sample Answers to Technical Comments on Spruce.docx

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Gregory Peck

Betsy and Joe, Betsy, thanks for our quick chat...

12/20/2010 06:39:05 PM

From: Gregory Peck/DC/USEPA/US
To: Betsy Behl/DC/USEPA/US@EPA, Joe Beaman/DC/USEPA/US@EPA
Cc: Palmer Hough/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, stoner.nancy@epa.gov
Date: 12/20/2010 06:39 PM
Subject: Spruce Veto and Selenium

Betsy and Joe,

(b) (5)
[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]

(b)
(5)

[REDACTED]

Thanks,
Greg

[attachment "2010-12-20 Potential OST Spruce comments.docx" deleted by Matthew Klasen/DC/USEPA/US] [attachment "Spruce FD draft 120110.doc" deleted by Matthew Klasen/DC/USEPA/US] [attachment "Appendix 4 Selenium 121010.doc" deleted by Matthew Klasen/DC/USEPA/US] [attachment "Appendix 2 Water Quality & Wildlife 121010.doc" deleted by Matthew Klasen/DC/USEPA/US]

Gregory E. Peck
Chief of Staff
Office of Water

**Matthew
Klasen/DC/USEPA/US**
12/21/2010 08:06 AM

To Erin Flannery
cc
bcc
Subject Fw: responses so far for 0800 call

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/21/2010 08:06 AM -----

From: Margaret Passmore/R3/USEPA/US
To: John Forren/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Matthew
Klasen/DC/USEPA/US@EPA
Date: 12/21/2010 07:31 AM
Subject: responses so far for 0800 call



ATTACHMENT REDACTED - DELIBERATIVE

Hunton-Williams Comments_69-242_MP_122010.docx

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
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Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

**Ross
Geredien/DC/USEPA/US**
12/21/2010 09:45 AM

To Palmer Hough
cc Brian Topping, Christopher Hunter
bcc
Subject Re: 7 comments from 242 - 301 that need responses

There's one I haven't heard before.

Ross Geredien
ORISE Fellow
EPA Office of Wetlands, Oceans, and Watersheds
202-566-1466
Geredien.ross(AT)epa.gov

Palmer Hough [U Rock Hot Fudge!](#) ... 12/21/2010 09:11:58 AM

From: Palmer Hough/DC/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA
Date: 12/21/2010 09:11 AM
Subject: Re: 7 comments from 242 - 301 that need responses

U Rock Hot Fudge!

Palmer Hough, Environmental Scientist
tel: 202.566.1374 | fax: 202.566.1375

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U.S. EPA Headquarters (MC 4502T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
www.epa.gov/wetlands

Brian Topping [Answers below - Palmer Hough---12/20/2010 0...](#) 12/21/2010 08:51:00 AM

From: Brian Topping/DC/USEPA/US
To: Palmer Hough/DC/USEPA/US@EPA
Cc: Christopher Hunter/DC/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA
Date: 12/21/2010 08:51 AM
Subject: Re: 7 comments from 242 - 301 that need responses

Answers below -

[Palmer Hough---12/20/2010 03:57:05 PM---245c.](#) The post-mined environment creates “severely altered conditions in stream courses that are n

From: Palmer Hough/DC/USEPA/US

To: Brian Topping/DC/USEPA/US@EPA

Cc: Ross Geredien/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA

Date: 12/20/2010 03:57 PM

Subject: 7 comments from 242 - 301 that need responses

245c. The post-mined environment creates “severely altered conditions in stream courses that are not destroyed by valley fills,” including “[a]ltered hydrograph with new flow regimes that markedly depart from that under which the streams have evolved” and “[a]ltered timing, temperature and chemical composition of post-mine discharges of water to receiving streams.” *Id.* at 70;

(b) (5)

A large rectangular area of text has been completely redacted with black ink.

245d. Some of the regulatory definitions of ephemeral, intermittent and perennial streams “are based on arbitrary watershed areas or flow cutoffs.” RD App. 3 at 1;

(b) (5)

A large rectangular area of text has been completely redacted with black ink.

262 EPA relies on the 2003 Paybins paper as the basis for its determination that the mitigation provided for in this permit is based on a misclassification of stream resources, contending that the Paybins paper advocates the use of drainage area as the sole basis for determining perennial and intermittent streams. RD App. 3 at 3-5. However, the Paybins study used by EPA does not support EPA’s contention. The study was conducted over a limited time period and with some inherent error given the data collection and analysis techniques. TED2 § 5.2. The Paybins study does shed light on the inherent variability of first-order watersheds, but does not justify a definition of perennial or intermittent streams based exclusively on the drainage area acreages utilized by EPA. *Id.* In fact, the author acknowledges “the local conditions for small headwater basins are extremely variable, and relations of these conditions to intermittent and perennial points could not be defined within this limited study.” K.S. Paybins, *Flow Origin, Drainage Area, and Hydrologic Characteristics for Headwater Streams in the Mountaintop Coal-Mining Region of Southern West Virginia, 2000-01* at 18, Water Resources Investigation Rpt. 02-4300, U.S. Geological Survey, Charleston, WV (2003), available at <http://pubs.usgs.gov/wri/wri02-4300/pdf/wri02-4300.book.pdf>. Thus, Paybins is a limited study which does not support a redefinition of stream classifications based exclusively on drainage area acreage.

(b) (5)

A large rectangular area of text has been completely redacted with black ink.

(b) (5)

269. NOTE - more than 2:1 mitigation provided

282 Green and Gingerich do not support EPA's conclusion that all created water bodies in mined areas will exceed water quality standards. The Green study evaluated a single erosion channel under conditions that are not representative of the mitigation requirements applicable to the Spruce No. 1 Mine. TED2 § 5.3. The Kirk study and the Gingerich thesis actually support the view that erosion control ditches can provide effective water quality and habitat functions and result in taxa abundance and diversity that support a balanced aquatic community. *Id.* As explained above, the Kirk study finds that erosion control channels perform an excellent job at removing water contaminants and provide aquatic habitats with abundant insects, amphibians, reptiles, and potentially even fish. The Gingerich thesis notes that there can be a macroinvertebrate and amphibian species shift in erosion control channels, but the abundance and richness of these species remains similar between erosion control channels and reference sites—a condition that supports a balanced aquatic community. *Id.*

(b) (5)

283 The examples given by EPA as the basis for its concerns about erosion control channels do not predict conditions at the Spruce No. 1 Mine. RD App. 3 at 6-8. For example, the mean conductivity for the Gingerich data is over 2000 iS/cm and the mean conductivity for the Green data is 2200 iS/cm, both of which are almost triple the worst case average projected by EPA in its conductivity analysis for the Spruce No. 1 site. RD at 51. EPA's examples are inapposite to the stream mitigation required by the Spruce permit because the WVSCI scores are so low at EPA's example sites that, were they to occur at the Spruce No. 1 site, the mitigation would fail the stringent performance criteria and remedial action or alternative mitigation would be required. Thus, the data cited by EPA is neither relevant to the wetland stream creation proposed for Spruce No.1 Mine nor to the permit conditions applicable to Mingo Logan's entire mitigation program.

(b) (5)

284 EPA contends that erosion control channels “should be considered sources of pollution rather than a mitigation feature” because “[d]ata show that water quality in sediment ditches in previously mined areas is highly degraded.” RD App. 3 at 6. However, aside from the fact that EPA’s examples are inapposite, EPA has failed to account for the legal requirements applicable to these erosion control channels. Under the Spruce No. 1 Mine permit issued by WVDEP, these erosion control channels cannot be utilized as mitigation structures until they are released from SMCRA regulation. Under Mingo Logan’s SMCRA permit, before the channels are released, they must meet all applicable Section 402 effluent limitations without treatment. Thus, contrary to EPA’s assertion, the water quality in the erosion control channels will not be highly degraded because the channels must comply with EPA’s own effluent limitations before they will be used as mitigation features.

(b) (5)

297 EPA also claims that the connectivity channels provided for in the Spruce No. 1 Mine permit “are expected to have minimal function for [] water quality reasons.” RD App. 3 at 11. However, as discussed in the section on erosion control channels, to comply with SMCRA, the water in the connectivity channels must be in compliance with all of the applicable effluent limitations without any prior treatment before they can be used as mitigation. Thus, due to the conditions of the SMCRA permit, the use of these connectivity channels for mitigation are expected to result in a functional stream from a water quality perspective.

(b) (5)

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www.epa.gov/wetlands

David Rider/R3/USEPA/US

12/21/2010 09:56 AM

To Stefania Shamet

cc

bcc

Subject HW responses - Selenium

Stef,

My additions for your use are included in green font. Questions?

Dave



ATTACHMENT REDACTED - DELIBERATIVE

SeleniumHW_responses.doc

**Matthew
Klasen/DC/USEPA/US**
12/21/2010 10:31 AM

To Glenn Suter, Susan Cormier
cc
bcc
Subject A few additional questions (183a, 184a, 185a, 187a)

Hey Glenn,

Thanks for jumping on the call (and sorry we thought it made sense for you to leave so quickly -- but I think it would be a better use of your time to get started on the rest).

Here are a few additional questions we just identified(attached). Call me with any questions.

Thanks,
Matt



ATTACHMENT REDACTED - DELIBERATIVE

Add'l questions for ORD (183a-187a).docx

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Brian Topping/DC/USEPA/US

12/21/2010 01:28 PM

To Ross Geredien, Christopher Hunter, Palmer Hough, Julia
McCarthy, Marcel Tchaou

cc Matthew Klasen, Brian Frazer

bcc

Subject Compiled Coal Mining Qs & As

Good Afternoon,

Attached is a consolidated group of Qs&As on EPA's activities on coal mining. These are pulled from the final versions prepared for the MOU, ECP list, and Guidance. At this time please add to the list of questions and if possible a draft answer. In addition feel free to go through the existing As and update / trim them down to concise one or two sentence answers. Current gaps in the document are specific projects (Spruce, Big Branch, others) and more detailed information on the SAB review and ORD reports.

This list will be useful to pull from as we prepare for congressional hearings.

Thanks,

Brian



ATTACHMENT REDACTED - DELIBERATIVE

Draft_Q-A_12-21-10.docx

The document can also be found here: G:\Wetlands Division\WARRB\Program Ops
Team\Coal_MTM-VF\MTM_Hearing_Prep

Brian Topping

US Environmental Protection Agency

Wetlands Division, Room 7231

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Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004

topping.brian@epa.gov

Kevin Minoli/DC/USEPA/US
12/21/2010 03:13 PM

To Matthew Klasen
cc
bcc
Subject Re: Google Doc spreadsheet for tracking responses to RD
comments (invite coming soon)

(b) (5)



ATTACHMENT REDACTED - DELIBERATIVE

Hunton-Williams Comments_1-68SDSCOMPARE.doc

Matthew Klasen Ok -- just made that change. Do you know if the... 12/21/2010 03:11:13 PM

From: Matthew Klasen/DC/USEPA/US
To: Kevin Minoli/DC/USEPA/US@EPA
Date: 12/21/2010 03:11 PM
Subject: Re: Google Doc spreadsheet for tracking responses to RD comments (invite coming soon)

(b) (5)

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Kevin Minoli This looks good, but I think some of the ones the... 12/21/2010 03:05:56 PM

From: Kevin Minoli/DC/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Date: 12/21/2010 03:05 PM
Subject: Re: Google Doc spreadsheet for tracking responses to RD comments (invite coming soon)

(b) (5)

Matthew Klasen Hi everyone, In light of the challenging deadlines... 12/21/2010 02:44:16 PM

From: Matthew Klasen/DC/USEPA/US
To: Kevin Minoli/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Erin Flannery/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Michael Slimak/DC/USEPA/US@EPA, Susan Cormier/CI/USEPA/US@EPA, Glenn Suter/CI/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA
Date: 12/21/2010 02:44 PM
Subject: Google Doc spreadsheet for tracking responses to RD comments (invite coming soon)

Hi everyone,

In light of the challenging deadlines and complexity of responding to new RD comments, we need some way of getting a handle on who is working on what.

I set up a Google spreadsheet so we can all track what's going on. For those of you who haven't used one of these before, we can all view where things stand on the comments and make edits, as appropriate. (This is designed to be a status tool, not as a venue for actually writing responses to comments.) **I'll send you all an invitation to view and edit the spreadsheet in a few minutes .**

I've populated the spreadsheet with basic information, including a basic subject of the new comments (98a-242a). I also took a shot at who I think has been assigned each question, but these reflect my sense of this morning's conversation. Feel free to update as appropriate.

I'm going to send an invitation for a call at 4 pm. If you're free, please participate; if you're crashing on other things (like writing responses), feel free to continue writing if you think that would be more valuable.

However, please send the group an updated draft of what you 've pulled together when you leave the office tonight so we get a sense of where things stand (and I'll update the spreadsheet at that point so we can prioritize effort tonight and tomorrow.

Thanks again for everyone's help under remarkable constraints. I'll send an invitation around shortly.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Palmer Hough/DC/USEPA/US

12/21/2010 03:18 PM

To Christopher Hunter

cc Ross Geredien, Julia McCarthy

bcc

Subject FD main report - v6

Here you go, I'm passing the baton.

-Palmer



ATTACHMENT REDACTED - DELIBERATIVE

Spence FD draft working_v6.doc

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tel: 202.566.1374 | fax: 202.566.1375

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1200 Pennsylvania Avenue, NW
Washington, DC 20460
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Betsy Behl/DC/USEPA/US

12/21/2010 03:33 PM

To Margaret Passmore

cc Brian Frazer, Christopher Hunter, Gregory Peck, Joe Beaman, John Forren, Karyn Wendelowski, Kevin Minoli, Matthew Klasen, Palmer Hough, Stefania Shamet, stoner.nancy, Charles Delos

bcc

Subject Re: Spruce Veto and Selenium

The water concentrations are in parts per billion (ug/L); the fish tissue concentrations are in parts per million (mg/l). Thanks for catching the typo, Margaret. see corrected version below.



Document Withheld - FOIA (b)(5)

2010-12-20 Potential OST Spruce comments-HECD.docx

Elizabeth (Betsy) Behl, Director

Health and Ecological Criteria Division
Office of Science and Technology, Office of Water
U.S. Environmental Protection Agency (4304T)
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

202.566.0788

202..566.1140 (fax)

Margaret Passmore [see 43a - is the acute criterion units of g/l? Mar...](#)

12/21/2010 03:11:13 PM

From: Margaret Passmore/R3/USEPA/US
To: Betsy Behl/DC/USEPA/US@EPA
Cc: Brian Frazer/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Joe Beaman/DC/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, stoner.nancy@epa.gov
Date: 12/21/2010 03:11 PM
Subject: Re: Spruce Veto and Selenium

[see 43a - is the acute criterion units of g/l?](#)

Margaret Passmore

Freshwater Biology Team

Office of Monitoring and Assessment (3EA50)

Environmental Assessment and Innovation Division

USEPA Region 3

1060 Chapline Street, Suite 303

Wheeling, WV 26003-2995

(p) 304-234-0245

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Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Betsy Behl [Greg: Joe, Charlie, and Marcus have developed...](#)

12/21/2010 03:05:38 PM

From: Betsy Behl/DC/USEPA/US
To: Gregory Peck/DC/USEPA/US@EPA
Cc: Brian Frazer/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Joe Beaman/DC/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, stoner.nancy@epa.gov
Date: 12/21/2010 03:05 PM
Subject: Re: Spruce Veto and Selenium

Greg: Joe, Charlie, and Marcus have developed the attached responses. Please let us know if you need additional assistance.

Best, Betsy[attachment "2010-12-20 Potential OST Spruce comments-HECD.docx" deleted by Margaret Passmore/R3/USEPA/US]

Gregory Peck

Betsy and Joe, Betsy, thanks for our quick chat...

12/20/2010 06:39:11 PM

From: Gregory Peck/DC/USEPA/US
To: Betsy Behl/DC/USEPA/US@EPA, Joe Beaman/DC/USEPA/US@EPA
Cc: Palmer Hough/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, stoner.nancy@epa.gov
Date: 12/20/2010 06:39 PM
Subject: Spruce Veto and Selenium

Betsy and Joe,

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Thanks,
Greg

[attachment "2010-12-20 Potential OST Spruce comments.docx" deleted by Betsy Behl/DC/USEPA/US]

[attachment "Spruce FD draft 120110.doc" deleted by Betsy Behl/DC/USEPA/US] [attachment "Appendix 4 Selenium 121010.doc" deleted by Betsy Behl/DC/USEPA/US] [attachment "Appendix 2 Water Quality & Wildlife 121010.doc" deleted by Betsy Behl/DC/USEPA/US]

Gregory E. Peck
Chief of Staff
Office of Water

**Christopher
Hunter/DC/USEPA/US**
12/21/2010 04:20 PM

To Brian Frazer, David Evans, Jim Pendergast, Denise Keehner,
Gregory Peck, Matthew Klasen, Kevin Minoli, Karyn
Wendelowski, Steven Neugeboren
cc Julia McCarthy, Ross Geredien, Marcel Tchaou, Brian
Topping, Stefania Shamet, Tanya Code, Palmer Hough
bcc
Subject Revised Version - Spruce FD 12-21-10

Hello all,
attached is the revised version of the Spruce FD main body, including all requested revisions. We will continue to polish and work on minor inconsistencies in formatting, so please review for more conceptual and substantive issues. As I understand it, the next revised version has to go to the Pete, Nancy, and Bob tomorrow COB, so please have any comments and edits back with enough time for us to turn around a clean version. I'll be in tomorrow to discuss and answer questions if needed.

In the meantime, I will be revising appendices based on comments sent last week to prepare those for final publication, and a wide group of people (OWOW, OST, OW, R3) are working on the hundreds of responses to comments that still need to be drafted. This is by far the largest piece of the puzzle that remains to be completed.

Thanks,
Chris

ATTACHMENTS REDACTED - DELIBERATIVE



Spruce FD 122110 draft clean.doc



Spruce FD 122110 draft redline.doc

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454
hunter.christopher@epa.gov

Brian Topping/DC/USEPA/US

12/21/2010 04:56 PM

To Matthew Klasen

cc

bcc

Subject Re: Mining Presentation from 8-3-09

Matt,

I have filled in some sections and done a little rearranging for flow / clarity. Unfortunately I have to leave soon and need to get a couple more things done first. (b) (5)

Good luck tomorrow and have a great holiday.

Brian



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-20 Draft Pete briefing for 12-22 - outline.ppt

Brian Topping

US Environmental Protection Agency

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topping.brian@epa.gov

Matthew Klasen

Hey Brian, I've been trapped with Spruce and ha...

12/21/2010 03:32:21 PM

From: Matthew Klasen/DC/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA
Date: 12/21/2010 03:32 PM
Subject: Re: Mining Presentation from 8-3-09

Hey Brian,

I've been trapped with Spruce and haven't gotten too far on this today. Attached is where I am at this point, and planning to get back to this after 4.

I think this is reasonably developed until the latter half of the ECP process description, so if you've got a few minutes to fill in (between now and 4:30 or so), that would be great!

I'll call you in a minute -- but here's my current draft.

Thanks,
Matt

[attachment "2010-12-20 Draft Pete briefing for 12-22 - outline.ppt" deleted by Brian Topping/DC/USEPA/US]

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Brian Topping Matt, Let me know if you have updated slides fo... 12/21/2010 03:20:46 PM

From: Brian Topping/DC/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Date: 12/21/2010 03:20 PM
Subject: Re: Mining Presentation from 8-3-09

Matt,
Let me know if you have updated slides for us to review / fill in. Thanks for carrying the load on this for tomorrow.
Brian

Brian Topping
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Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004
topping.brian@epa.gov

Matthew Klasen Hey Brian, See attached for a straw framework f... 12/20/2010 10:33:28 AM

From: Matthew Klasen/DC/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA
Date: 12/20/2010 10:33 AM
Subject: Re: Mining Presentation from 8-3-09

Hey Brian,

See attached for a straw framework for the presentation (basically a slide on each of the proposed topics I sent earlier) with a little more detail on what I think would make sense to cover. I deleted all the picture-heavy slides from the previous version just to save space when emailing this (we can pull from those slides for the first few topics).

Thanks,
Matt

[attachment "2010-12-20 Draft Pete briefing for 12-22 - outline.ppt" deleted by Brian Topping/DC/USEPA/US]

Matt Klasen
U.S. Environmental Protection Agency
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202-566-0780
cell (202) 380-7229

Matthew Klasen OK -- 10 was a bad guess! Talk to you soon. mk... 12/20/2010 09:56:37 AM

From: Matthew Klasen/DC/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA
Date: 12/20/2010 09:56 AM
Subject: Re: Mining Presentation from 8-3-09

OK -- 10 was a bad guess! Talk to you soon.

mk

Matt Klasen
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Brian Topping

Matt, I'll call you at 10:30 or 11:30. I am free all...

12/20/2010 09:50:54 AM

From: Brian Topping/DC/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Date: 12/20/2010 09:50 AM
Subject: Re: Mining Presentation from 8-3-09

Matt,
I'll call you at 10:30 or 11:30. I am free all day except at 10 and I am not sure how long it will last.
Dividing up the slides into sections sounds good, but we'll need to talk some to sort out the details of what is wanted.
Talk to you then,
Brian

Brian Topping
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topping.brian@epa.gov

Matthew Klasen

Hey Brian, Sorry for my delinquency in getting ar...

12/20/2010 09:10:19 AM

From: Matthew Klasen/DC/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA
Date: 12/20/2010 09:10 AM
Subject: Re: Mining Presentation from 8-3-09

Hey Brian,

Sorry for my delinquency in getting around to this topic until the weekend. Are you free to chat at 10? (I've got Spruce stuff in a couple minutes till then.)

I haven't yet made significant changes to the briefing itself -- that's my priority for today -- but I did focus on trying to think of the most important topics to cover. Some of this we can take from the previous briefing, but a lot of it is new.

Here's what I'm suggesting as the major topics, and I took a shot at what seemed to make sense in terms of developing slides (not necessarily who would walk through the slides on Wednesday). Let's talk about whether these make sense as assignments and topics.

(b) (5)



(b) (5)



(b) (5)



Let me know if 10 works for you; if not, I could do 10:30 or 11:30 this morning, too.

Thanks,
Matt

Matt Klasen
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202-566-0780
cell (202) 380-7229

Brian Topping

Matt, Let me know when you have edits or thou...

12/17/2010 02:07:38 PM

From: Brian Topping/DC/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Cc: Brian Frazer/DC/USEPA/US@EPA
Date: 12/17/2010 02:07 PM
Subject: Re: Mining Presentation from 8-3-09

Matt,
Let me know when you have edits or thoughts for the presentation. We have also pulled together a number of other supporting documents identified on the attached draft table of contents - the ones in

yellow are still being worked on.
Thanks,
Brian

[attachment "BriefingBook_TOC_v1.docx" deleted by Matthew Klasen/DC/USEPA/US]

Brian Topping
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Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460
Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004
topping.brian@epa.gov

Matthew Klasen	Thanks Brian. I'll take a look at this and get bac...	12/16/2010 04:27:44 PM
----------------	---	------------------------

From: Matthew Klasen/DC/USEPA/US
To: Brian Topping/DC/USEPA/US@EPA
Date: 12/16/2010 04:27 PM
Subject: Re: Mining Presentation from 8-3-09

Thanks Brian. I'll take a look at this and get back to you -- I'm also planning to be out tomorrow but working from home.

Matt Klasen
U.S. Environmental Protection Agency
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cell (202) 380-7229

Brian Topping	Matt, Here is the presentation for Pete from 8-3-...	12/16/2010 07:57:15 AM
---------------	--	------------------------

From: Brian Topping/DC/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Date: 12/16/2010 07:57 AM
Subject: Mining Presentation from 8-3-09

Matt,
Here is the presentation for Pete from 8-3-09. This morning is full but we can talk later today or tomorrow when I'll be working from home.
Thanks,
Brian
[attachment "Mining_AAOW briefing_8-3-09.ppt" deleted by Matthew Klasen/DC/USEPA/US]

Brian Topping
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Wetlands Division, Room 7231
Office: 202-566-5680, FAX: 202-566-1375
Mail Code 4502T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460
Deliveries: EPA West -- Room 7231-S, 1301 Constitution Avenue, NW, Washington, DC 20004
topping.brian@epa.gov

Christopher
Hunter/DC/USEPA/US
12/21/2010 05:17 PM

To Erin Flannery
cc
bcc
Subject Fw: Initial Thoughts on Aug 12 WVDEP MTM Guidance

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454
hunter.christopher@epa.gov

----- Forwarded by Christopher Hunter/DC/USEPA/US on 12/21/2010 05:17 PM -----

From: Brian Frazer/DC/USEPA/US
To: Christopher Hunter/DC/USEPA/US, Timothy Landers/DC/USEPA/US, "Brian Topping"
<Topping.Brian@epamail.epa.gov>
Date: 08/12/2010 04:58 PM
Subject: Fw: Initial Thoughts on Aug 12 WVDEP MTM Guidance

Brian Frazer
Chief, Wetlands & Aquatic Resources Regulatory Branch
O:202-566-1652
C:202-379-6906

Sent from my BlackBerry Wireless Handheld
Gregory Peck

----- Original Message -----

From: Gregory Peck
Sent: 08/12/2010 03:28 PM EDT
To: Matthew Klasen; David Evans; Brian Frazer; Karyn Wendelowski; Kevin Minoli; Marcus Zobrist; Gary Hudiburgh; Jeffrey Lapp; John Pomponio; Stefania Shamet; Jon Capacasa; Evelyn MacKnight
Subject: Initial Thoughts on Aug 12 WVDEP MTM Guidance

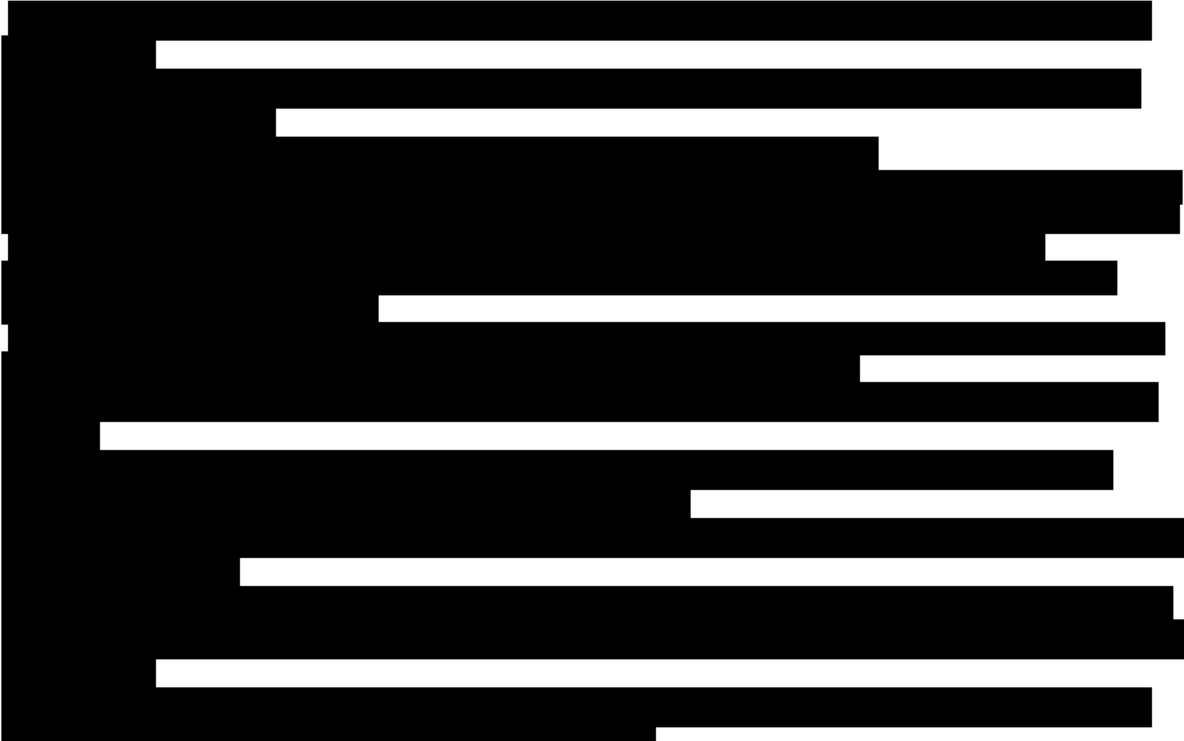
(b) (5)



(b) (5)

[illegible]

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

- 

Gregory E. Peck
Chief of Staff
Office of Water
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

202-564-5778

Glenn Suter/CI/USEPA/US

12/21/2010 05:37 PM

To Matthew Klasen

cc Michael Slimak, Susan Cormier

bcc

Subject Re: Fw: Recommended Determination for Spruce No 1.
Surface Mine - Appendix A

(b) (5)



ATTACHMENT REDACTED - DELIBERATIVE

Add'l questions for ORD (183a-187a)_GSscversion 2.docx

Matthew Klasen

[Here's the CH2M Hill report discussed on the m...](#)

12/21/2010 04:46:38 PM

From: Matthew Klasen/DC/USEPA/US
To: Glenn Suter/CI/USEPA/US@EPA, Susan Cormier/CI/USEPA/US@EPA
Cc: Michael Slimak/DC/USEPA/US@EPA
Date: 12/21/2010 04:46 PM
Subject: Fw: Recommended Determination for Spruce No 1. Surface Mine - Appendix A

(b) (5)

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/21/2010 04:43 PM -----

From: Gregory Peck/DC/USEPA/US
To: Brian Frazer/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA
Date: 12/01/2010 01:11 PM
Subject: Fw: Recommended Determination for Spruce No 1. Surface Mine - Appendix A

Two huge files from Arch - I'll send the second separately.

Greg

----- Forwarded by Gregory Peck/DC/USEPA/US on 12/01/2010 01:08 PM -----

From: "Melewski, Matthew" <MMelewski@hunton.com>
To: Peter Silva/DC/USEPA/US@EPA, LisaP Jackson/DC/USEPA/US@EPA, Bob Sussman/DC/USEPA/US@EPA, Shawn Garvin/R3/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, <joellen.darcy@us.army.mil>, <tasha.v.garrick@usace.army.mil>, <meg.e.gaffney-smith@usace.army.mil>, <robert.d.peterson.col@usace.army.mil>, <ginger.mullins@usace.army.mil>, <randy.c.huffman@wv.gov>
Cc: "Rolfe, Robert" <rrolfe@hunton.com>, "Duncan, Deidre" <dduncan@hunton.com>, "Mann, Rachel" <rkmann@hunton.com>
Date: 11/29/2010 09:38 PM
Subject: Recommended Determination for Spruce No 1. Surface Mine - Appendix A

Mr. Silva,

Attached please find exhibits to the comments, as well as a technical evaluation document.

Regards,
Matthew Melewski



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[attachment "Exhibits and Tech Eval Doc--Mingo Logan Comments on RD Nov 2010.pdf"
deleted by Glenn Suter/CI/USEPA/US]

Glenn Suter/CI/USEPA/US
12/21/2010 05:52 PM

To: Matthew Klasen
cc
bcc
Subject: Re: Spruce comments

(b) (5)

Matthew Klasen

Thanks for the clarifications. I didn't realize the e...

12/21/2010 04:43:33 PM

From: Matthew Klasen/DC/USEPA/US
To: Glenn Suter/CI/USEPA/US@EPA
Date: 12/21/2010 04:43 PM
Subject: Re: Spruce comments

(b) (5)

I'll forward you, Mike, and Susan that report in a moment.

mk

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

Glenn Suter

Matt, I would like to clarify a couple of things. (b)

12/21/2010 04:39:53 PM

From: Glenn Suter/CI/USEPA/US
To: Matthew Klasen/DC/USEPA/US@EPA
Date: 12/21/2010 04:39 PM
Subject: Spruce comments

Matt, I would like to clarify a couple of things.

(b) (5)

Kevin Minoli/DC/USEPA/US

12/21/2010 05:54 PM

To Stefania Shamet

cc Matthew Klasen, Karyn Wendelowski

bcc

Subject A couple draft responses for you

Hey Stef- You assigned so many response to yourself I thought I would see if I could take some of the easy ones off your plate. Here are draft responses for five of them that you can use (obviously feel free to edit as necessary).

Thanks, Kevin



ATTACHMENT REDACTED - DELIBERATIVE

RTCs for 4 6 9 11 19.doc

**Matthew
Klasen/DC/USEPA/US**
12/21/2010 08:10 PM

To "Gregory Peck"
cc
bcc
Subject Fw: answers so far

In case you want to forward to Steve, here are most of the answers so far (not including about 12 from ORD, 6 from OST, and about 5 from Kevin.

Matt Klasen
U.S. Environmental Protection Agency
Office of Water
(202) 566-0780
Cell (202) 380-7229
Margaret Passmore

----- Original Message -----

From: Margaret Passmore
Sent: 12/21/2010 03:53 PM EST
To: John Forren; Matthew Klasen; Stefania Shamet
Cc: Greg Pond
Subject: answers so far



ATTACHMENT REDACTED - DELIBERATIVE

Hunton-Williams Comments_69-242_MP_122110.docx

Margaret Passmore
Freshwater Biology Team
Office of Monitoring and Assessment (3EA50)
Environmental Assessment and Innovation Division
USEPA Region 3
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
(p) 304-234-0245
(f) 304-234-0260
passmore.margaret@epa.gov

Visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

**Matthew
Klasen/DC/USEPA/US**
12/21/2010 08:41 PM

To Gregory Peck, Kevin Minoli
cc
bcc
Subject Fw: My comments on the RTC

Greg/Kevin:

And if Steve wants something to look at tonight, this might be instructive too (though it represents PD comments and is far more developed than where we are on RD).

mk

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Forwarded by Matthew Klasen/DC/USEPA/US on 12/21/2010 01:03PM

To: Palmer Hough/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Erin Flannery/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA
From: Kevin Minoli/DC/USEPA/US
Date: 12/21/2010 01:48PM
Subject: My comments on the RTC

All-- Attached are my comments on all of the comment responses that have been drafted so far. I put them all into a single document so this can probably start to serve as the "master" RTC document. There are quite a few comment bubbles from Stef in there that I didn't remove. In addition to those there are a handful of places where I included a comment bubble suggesting that comment needed more of a response (and it was one that I couldn't respond to). Not sure about the process for going back and dealing with those bubbles, but I wanted to make sure people knew they were there.

I think we are going to have a check in call this afternoon, so people can ask questions then or send them to me know.

Thanks, Kevin

ATTACHMENT REDACTED - DELIBERATIVE

(See attached file: Spruce RTC.org.doc)



- Spruce RTC.org.doc

Matthew
Klasen/DC/USEPA/US
12/21/2010 09:04 PM

To: Steven Neugeboren
cc: Kevin Minoli, Karyn Wendelowski, Gregory Peck
bcc:
Subject: Re: Fw: More info

Hi Steve,

Greg forwarded me your note from earlier.

(b) (5) DPP ACP



Let me know if you have any questions.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Gregory Peck/DC/USEPA/US wrote: -----

To: "Matthew Klasen" <Klasen.Matthew@epamail.epa.gov>
From: Gregory Peck/DC/USEPA/US
Date: 12/21/2010 07:34PM
Subject: Fw: More info

Can you respond to this easily?

Gregory E. Peck
Chief of Staff
Office of Water
U.S. E.P.A.

Steven Neugeboren

----- Original Message -----


From: Steven Neugeboren
Sent: 12/21/2010 07:03 PM EST

To: Kevin Minoli; Karyn Wendelowski; Gregory Peck

Subject: More info

(b) (5) DPP ACP



Sent by EPA Wireless E-Mail Services  - Spruce RTC.org.doc  - Hunton-Williams
Comments_69-242_MP_122110.docx

ATTACHMENTS REDACTED - DELIBERATIVE

Glenn Suter/CI/USEPA/US
12/21/2010 09:13 PM

To Matthew Klasen
cc Susan Cormier, Michael Slimak
bcc
Subject Re: Fw: Recommended Determination for Spruce No 1.
Surface Mine - Appendix A

(b) (5)



-----Matthew Klasen/DC/USEPA/US wrote: -----

To: Glenn Suter/CI/USEPA/US@EPA, Susan Cormier/CI/USEPA/US@EPA
From: Matthew Klasen/DC/USEPA/US
Date: 12/21/2010 04:44PM
Cc: Michael Slimak/DC/USEPA/US@EPA
Subject: Fw: Recommended Determination for Spruce No 1. Surface Mine - Appendix A

(b) (5)



Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/21/2010 04:43 PM -----

Fro Gregory Peck/DC/USEPA/US
m:
To: Brian Frazer/DC/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Matthew
Klasen/DC/USEPA/US@EPA, John Pomponio/R3/USEPA/US@EPA, Stefania
Shamet/R3/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA
Dat 12/01/2010 01:11 PM
e:
Sub Fw: Recommended Determination for Spruce No 1. Surface Mine - Appendix A
ject
:

Two huge files from Arch - I'll send the second separately.

Greg

----- Forwarded by Gregory Peck/DC/USEPA/US on 12/01/2010 01:08 PM -----

Fro "Melewski, Matthew" <MMelewski@hunton.com>
m:
To: Peter Silva/DC/USEPA/US@EPA, LisaP Jackson/DC/USEPA/US@EPA, Bob
Sussman/DC/USEPA/US@EPA, Shawn Garvin/R3/USEPA/US@EPA, Gregory
Peck/DC/USEPA/US@EPA, <joellen.darcy@us.army.mil>, <tasha.v.garrick@usace.army.mil>,
<meg.e.gaffney-smith@usace.army.mil>, <robert.d.peterson.col@usace.army.mil>,
<ginger.mullins@usace.army.mil>, <randy.c.huffman@wv.gov>
Cc: "Rolfe, Robert" <rrolfe@hunton.com>, "Duncan, Deidre" <dduncan@hunton.com>, "Mann, Rachel"
<rkmann@hunton.com>
Dat 11/29/2010 09:38 PM
e:
Sub Recommended Determination for Spruce No 1. Surface Mine - Appendix A
ject
:

Mr. Silva,

Attached please find exhibits to the comments, as well as a technical evaluation document.

Regards,
Matthew Melewski

		Matthew D. Melewski mmelewski@hunton.com Hunton & Williams LLP 1900 K Street, N.W. Washington, DC 20006 Phone: (202) 419-2168 Fax: (202) 861-3699 www.hunton.com	
---	--	--	--

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(See attached file: Exhibits and Tech Eval Doc--Mingo Logan Comments on RD Nov 2010.pdf)

[attachment "Exhibits and Tech Eval Doc--Mingo Logan Comments on RD Nov 2010.pdf" removed by Glenn Suter/CI/USEPA/US]



- Add'l questions for ORD (183a-187a)_GSscversion 2.docx

ATTACHMENT REDACTED - DELIBERATIVE

Brian Frazer/DC/USEPA/US

12/21/2010 10:01 PM

To David Evans

cc

bcc

Subject Fw: Draft PPT for Pete mock hearing tomorrow on MTM (for quick review)

(b) (5)

Brian Frazer
Chief, Wetlands & Aquatic Resources Regulatory Branch
O:202-566-1652
C:202-379-6906

Sent from my BlackBerry Wireless Handheld
Matthew Klasen

----- Original Message -----

From: Matthew Klasen

Sent: 12/21/2010 07:25 PM EST

To: Brian Frazer; Brian Topping; Gregory Peck; Karyn Wendelowski; Kevin Minoli; Christopher Hunter

Subject: Draft PPT for Pete mock hearing tomorrow on MTM (for quick review)

(b) (5)



ATTACHMENT REDACTED - DELIBERATIVE

2010-12-21 Draft Pete briefing for 12-22.ppt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

**Matthew
Klasen/DC/USEPA/US**
12/21/2010 10:08 PM

To Christopher Hunter
cc
bcc
Subject Re: Timing on appendix 4&5 edits - edits attached

Thanks -- and sorry for the delay. See attached for my thoughts on 4 and 5. In particular, I thought 5 would benefit from an abstract like the others, so I endeavored to take a shot at writing one .

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Christopher Hunter/DC/USEPA/US wrote: -----

To: Matthew Klasen/DC/USEPA/US@EPA
From: Christopher Hunter/DC/USEPA/US
Date: 12/21/2010 09:25PM
Subject: Re: Timing on appendix 4&5 edits

I've already completed edits on those 2, but I haven't handed them off yet. No problem if you get me edits by tomorrow morning.

Chris

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454
hunter.christopher@epa.gov

-----Matthew Klasen/DC/USEPA/US wrote: -----



To: "Christopher Hunter" <Hunter.Christopher@epamail.epa.gov>
From: Matthew Klasen/DC/USEPA/US
Date: 12/21/2010 07:51PM
Subject: Timing on appendix 4&5 edits

Hey Chris,

Are you going to be editing 4 and 5 shortly? I'm planning to go through those again tonight (within the next few hours) but wanted to know if you need edits more quickly.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water
(202) 566-0780

Cell (202) 380-7229  - Appendix 4 Selenium 121010 - mk.doc  - Appendix 5 Cumulative
Impacts 121010.doc

ATTACHMENT REDACTED - DELIBERATIVE

Palmer Hough/DC/USEPA/US

12/22/2010 01:11 AM

To Matthew Klasen, Christopher Hunter

cc Gregory Peck, Karyn Wendelowski, Kevin Minoli, Brian Frazer

bcc

Subject Re: Revised Version - Spruce FD 12-21-10

(b) (5)

P

Sent from my BlackBerry Wireless Device

Palmer Hough, Environmental Scientist
Wetlands Division
U.S. EPA, Headquarters
tel: 202.566.1374

From: Matthew Klasen

Sent: 12/22/2010 12:18 AM EST

To: Christopher Hunter

Cc: Gregory Peck; Karyn Wendelowski; Kevin Minoli; Brian Frazer; Palmer Hough

Subject: Re: Revised Version - Spruce FD 12-21-10

Hi Chris,

(b) (5)

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

-----Christopher Hunter/DC/USEPA/US wrote: -----

To: Brian Frazer/DC/USEPA/US@EPA, David Evans/DC/USEPA/US@EPA, Jim Pendergast/DC/USEPA/US@EPA, Denise Keehner/DC/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Matthew Klasen/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA, Steven Neugeboren/DC/USEPA/US@EPA
From: Christopher Hunter/DC/USEPA/US
Date: 12/21/2010 04:20PM
Cc: Julia McCarthy/R8/USEPA/US@EPA, Ross Geredien/DC/USEPA/US@EPA, Marcel Tchaou/DC/USEPA/US@EPA, Brian Topping/DC/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA
Subject: Revised Version - Spruce FD 12-21-10

Hello all,
attached is the revised version of the Spruce FD main body, including all requested revisions. We will continue to polish and work on minor inconsistencies in formatting, so please review for more conceptual and substantive issues. As I understand it, the next revised version has to go to the Pete, Nancy, and Bob tomorrow COB, so please have any comments and edits back with enough time for us to turn around a clean version. I'll be in tomorrow to discuss and answer questions if needed.

In the meantime, I will be revising appendices based on comments sent last week to prepare those for final publication, and a wide group of people (OWOW, OST, OW, R3) are working on the hundreds of responses to comments that still need to be drafted. This is by far the largest piece of the puzzle that remains to be completed.

Thanks,
Chris

(See attached file: Spruce FD 122110 draft clean.doc) (See attached file: Spruce FD 122110 draft redline.doc)

Chris Hunter
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, & Watershed
(202) 566-1454
hunter.christopher@epa.gov

[attachment "Spruce FD 122110 draft clean.doc" removed by Matthew Klasen/DC/USEPA/US]
[attachment "Spruce FD 122110 draft redline.doc" removed by Matthew Klasen/DC/USEPA/US]

Stefania
Shamet/R3/USEPA/US
12/22/2010 05:37 AM

To Christopher Hunter, Palmer Hough, Matthew Klasen
cc Kevin Minoli, Karyn Wendelowski, Jessica Greathouse, Greg
Pond, Margaret Passmore
bcc
Subject Spruce -- Responses to PD comments 96-150

Here you go.

Kevin -- not sending a redline, but there were changes from last night on a couple. Most notable is probably 128.

Jessica -- #124 responds to Congressman Rahall by name, so I thought you should take a look.



ATTACHMENT REDACTED - DELIBERATIVE

Spruce responses 96-150.doc

Matthew
Klasen/DC/USEPA/US
12/22/2010 07:58 AM

To Steven Neugeboren
cc
bcc
Subject Fw: Status of RD comments

FYI

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780
cell (202) 380-7229

----- Forwarded by Matthew Klasen/DC/USEPA/US on 12/22/2010 07:57 AM -----

From: Matthew Klasen/DC/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA, Christopher Hunter/DC/USEPA/US@EPA, Kevin Minoli/DC/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Brian Frazer/DC/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Erin Flannery/DC/USEPA/US@EPA, David Kargbo/R3/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA, Greg Pond/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Karyn Wendelowski/DC/USEPA/US@EPA
Cc: John Pomponio/R3/USEPA/US@EPA, Gregory Peck/DC/USEPA/US@EPA, Tanya Code/DC/USEPA/US@EPA
Date: 12/22/2010 06:52 AM
Subject: Status of RD comments

Hi everyone,

Purely for "where are we now" purposes, I thought I'd send out a summary of Spruce RD comment responses, based on the tracking spreadsheet and info I've received.

Overall, about 190 comments need responses. All are assigned to someone (based on my assessment) except about ten. 46 responses are drafted or partially drafted. The remainder await responses (or haven't been sent to me). Responses came in yesterday from Kevin, ORD, OST, and Maggie so far (recognizing that Greg Pond is probably still working on some that Maggie originally drafted).

Of the responses not yet drafted, below is a numeric breakdown of who seems to be responsible for those responses (based on the best information I have right now).

Number of Non-Drafted Comments Assigned To Each Person

Dave Kargbo 5
Dave Rider 6
Greg Pond 11
Lou Reynolds 1
Maggie Passmore 13 (note: Greg Pond may be the default to take these now if Maggie's out)
Palmer Hough 42 (working on them on flight to SEA yesterday)
Stef Shamet 48 (will be starting today)
Erin Flannery 9 (working last night / this AM)
Unknown 14 (I need to ID people for these, and some of them not need responses at all)
TOTAL 149

So, to-dos for folks on this list (if you would):

- Take a look at the attached PDF (taken directly from the tracking spreadsheet) and let me know if any of the numbered comment assignments seem wrong. The attachment lists only the responses not yet drafted, and is sorted by person's name.
- Please don't start drafting any questions that you're not currently assigned to on the attached spreadsheet, unless you check with the person it's assigned to and you let me know. This should prevent duplication of effort.

Hope this is helpful, and let me know if you have any questions. My next step is to go through the comments and pick out the "show-stopper"-looking ones as we discussed yesterday afternoon, which I'll then circulate.

Thanks,
Matt

Matt Klasen
U.S. Environmental Protection Agency
Office of Water (IO)
202-566-0780



ATTACHMENT REDACTED - DELIBERATIVE

cell (202) 380-7229 22 am.pdf

Carrie Traver/R3/USEPA/US
12/22/2010 08:50 AM

To Frank Borsuk
cc David Rider, John Forren, Margaret Passmore, Regina
Poeske, Stefania Shamet
bcc
Subject Re: Response ---Re: Spruce reference questions

Frank,

Got all those, thanks. Dave gave me the USFWS 2004 information, so we're good...at least until we have another question.

Happy Holidays!
Carrie

Carrie Traver
USEPA Region 3
Office of Environmental Programs
1650 Arch Street - 3EA30
Philadelphia, PA 19103
215-814-2772
traver.carrie@epa.gov

Frank Borsuk

Carrie: Our response -- .

12/21/2010 02:08:51 PM

From: Frank Borsuk/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA
Cc: David Rider/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret
Passmore/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Stefania
Shamet/R3/USEPA/US@EPA
Date: 12/21/2010 02:08 PM
Subject: Response ---Re: Spruce reference questions

Carrie:

Our response -- .

(b) (5) [REDACTED]

[REDACTED]

[REDACTED]

Frank

Frank Borsuk, Ph.D.
Aquatic/Fisheries Biologist
Freshwater Biology Team
USEPA-Region 3 (Wheeling Office)

Office of Monitoring & Assessment (3EA50)
Environmental Assessment & Innovation Division
1060 Chapline Street, Suite 303
Wheeling, WV 26003-2995
304-234-0241 Phone
304-234-0260 Fax
borsuk.frank@epa.gov

Please visit our website at <http://epa.gov/reg3esd1/3ea50.htm>

Carrie Traver

So to recap what we still need for the selenium s...

12/20/2010 09:50:07 AM

From: Carrie Traver/R3/USEPA/US
To: Frank Borsuk/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, David Rider/R3/USEPA/US@EPA
Date: 12/20/2010 09:50 AM
Subject: Spruce reference questions

So to recap what we still need for the selenium section...

(b) (5) [REDACTED]

[REDACTED]

[REDACTED]

Thanks!

Carrie

Carrie Traver
USEPA Region 3
Office of Environmental Programs
1650 Arch Street - 3EA30
Philadelphia, PA 19103
215-814-2772
traver.carrie@epa.gov

Stefania Shamet

If it makes you feel better, Maggie, John F., Dav...

12/16/2010 02:01:37 PM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA
Cc: Frank Borsuk/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/16/2010 02:01 PM
Subject: Re: Help with Spruce

If it makes you feel better, Maggie, John F., Dave and I are into our 12th year with Spruce Thanks again!

Carrie Traver

(b) (5) [REDACTED]

12/16/2010 01:51:35 PM

From: Carrie Traver/R3/USEPA/US
To: Frank Borsuk/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA, Stefania Shamet/R3/USEPA/US@EPA
Date: 12/16/2010 01:51 PM
Subject: Re: Help with Spruce

(b) (5)




Carrie Traver
USEPA Region 3
Office of Environmental Programs
1650 Arch Street - 3EA30
Philadelphia, PA 19103
215-814-2772
traver.carrie@epa.gov

Stefania Shamet

(b) (5)



12/16/2010 01:38:57 PM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA, Frank Borsuk/R3/USEPA/US@EPA, Margaret Passmore/R3/USEPA/US@EPA
Cc: Regina Poeske/R3/USEPA/US@EPA, John Forren/R3/USEPA/US@EPA
Date: 12/16/2010 01:38 PM
Subject: Re: Help with Spruce

(b) (5)




Carrie Traver

(b) (5)



12/16/2010 01:14:58 PM

From: Carrie Traver/R3/USEPA/US
To: Stefania Shamet/R3/USEPA/US@EPA, Regina Poeske/R3/USEPA/US@EPA
Date: 12/16/2010 01:14 PM
Subject: Re: Help with Spruce

(b) (5)




(b) (5)

[Redacted]

[Redacted]

Hope that helps-
Carrie

Carrie Traver
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1650 Arch Street - 3EA30
Philadelphia, PA 19103
215-814-2772
traver.carrie@epa.gov

Stefania Shamet Hi Carrie. I'm working my way through the respo... 12/16/2010 09:34:41 AM

From: Stefania Shamet/R3/USEPA/US
To: Carrie Traver/R3/USEPA/US@EPA
Cc: Regina Poeske/R3/USEPA/US@EPA
Date: 12/16/2010 09:34 AM
Subject: Help with Spruce

Hi Carrie. I'm working my way through the response summary (b) (5)

[Redacted]

[Redacted]

[Redacted]

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

(b) (5)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Julia McCarthy/R8/USEPA/US

To Christopher Hunter, Matthew Klasen

12/22/2010 10:44 AM

cc Palmer Hough

bcc

Subject Response to comments

Matt and Chris,

As I mentioned earlier, the numbering is off in this version, as I lumped several comments together...

Cheers,

Julia



ATTACHMENT REDACTED - DELIBERATIVE

Hunton-Williams Consolidated Comments_jmm.docx

Julia McCarthy

on detail to USEPA Headquarters

Office of Wetlands, Oceans and Watersheds

(202) 566-1660

mccarthy.julia@epa.gov

A land ethic, then, reflects the existence of an ecological conscience, and this in turn reflects a connection of individual responsibility for the health of the land. Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity. ~Aldo Leopold